

Commodore **HORIZONS**

The independent Commodore magazine

79p February 1984

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MATHEMATICAL LOGIC ON THE VIC AND 64

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Commodore Horizons welcomes readers' contributions — either articles or program listings. Articles should be typed double-spaced with a wide margin. Programs should, wherever possible, be printed out on plain white paper, accompanied by a cassette. We cannot guarantee to return every article or program submission, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.



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A point response to our last comparison, problems with Excel II level, and some handy programming tips

News

A powerful new graphics tablet, the Eagle Printer. Features along with a selection of new musical hardware and software and a minor explosion of arcade style games — plus all the latest on Commodore's new mouse

Software review



Frog-Crossed continues its critical look at the box — and the rest — of the current games software releases including Falcon Patrol featured above

Disk drives discussed

In the dark about disk drives? Help us at hand as this disconcerting feature which also explores the world of modems

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Art was special

Play Area Attack on the Vic and Plus on the 64 (from cover by Brian Hough)

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Market view

We bring you the latest on Commodore's market prospects

Competition

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EDITORIAL

OUR CAMPAIGN TO persuade more independent companies to produce Commodore software can only succeed if shared with our readers. But long your letters coming in — the more people who write to support us, the more pressure we can put on the software houses. And the higher number of potential purchasers we can point to, the more a machine will be prepared to turn to software houses.

As we pointed out in our first issue there are very few firms producing Commodore software — particularly compared to the hundreds of small, innovative software firms producing original material for the Spectrum. We think it is time that those firms started producing software for the Commodore range of machines. If you agree, then why not join us in our campaign to persuade Spectrum software houses to start writing for the Vic 20 and CPM 64?

Response to the launch of the campaign at our first event was stirring, with only one person dissenting. This reader thought there was no need for the campaign, and that we should instead be supporting those companies who have already put time and investment into writing Commodore software. We have no objection to anyone who does this — in each issue we'll be reviewing the latest software available and in our news we'll be giving you readers an idea of what there is to look forward to. But we're not convinced by this reader's arguments, and the rest of the letters seemed to be for support us. The point made by most readers was that their machines were popular but the range of software available was not. To put an response to readers: "What ought to be done is for someone to adopt a more positive attitude to the software potential of the 64. It therefore supports your persistence as to software houses to increase and vary software available p. 1. And another: "On reviewing the software available, I find myself in total agreement with your editorial. Despite our potential the 64 would appear to be inadequately covered by the software houses."

This reader added: "There are relatively few games available and virtually no educational software. So, please, more educational software for pre-G-level and some software — any — at the shops." In fact the most common cry was for educational software although there also seems to be a need for small business programs. Some requests were very specific — one "whereas am" is especially keen to get a good version of *Scrabble*. Whatever your needs, if you want more firms to produce software for the Vic 20 and CPM 64 write us to and let us know — we'll make sure your views are heard.

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LETTERS PAGE

Competition cornered

In response to the available problems in your *Competition Corner*, may I offer the following comments:
Free means: lends, owners and writers.
Free programs: giving wordsearch correct.
A floppy drive: words revealed and.
To give incentive to a lead.
To solve a puzzle, what you where.
What does the joystick to the chess?
And what is it that cannot see.
Their program on reality such TV?

Each has a peripheral, only one.
To make their program loss of fun.
A joystick, video box, printer pen.
That is lost, so now let's think again.
A floppy reader, there that is fun?
So why brought in this cassette drive?
The extrapolated brings us to Amecness: we can add to Vex.

Master Roberts' problem was.
Thought he'd make the puzzle better.
Then suppose with any more,

On even Apple, Lisa, and master,
Could solve to win a high speed score.
He must be saving Commodors.
The pain of having to donate
A fast magazine storage place.
The prize is not a given away.
Two hundred good is what you'll pay,
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By the day you've saved the sum.
To buy your fifteen karyons?

If pencils set in Club Hill Neck.
Are featured often in your book.
There's only one more thing to say.
"Purchase your" Hill Top D.K.?"
John Corley
Middletown
Kent

The competition certainly raised a lot of problems.
I'm sure due to not making up ideas and comments — we promise to sort things out at Club Hill Neck from now on.

One reader suggested that the joystick belongs "to Horowitz, who left it there last week, and it was not needed among all the more like needed at his last time."
"Nice try, but wrong answer."
A lot of people, however,

have got it right on time, and we'll continue the search and the answer next month in the meantime we'll try to think of an alternative prize for John's entry.

Slick Vic tricks

CONGRATULATIONS on producing a first class issue. It is the first time I have found a magazine with programs using the Super Expander Pack on the VIC 20. It would be nice to see more.

Both sources on page 31 worked fine today, quite amazing after so many of his magazine programs resulting in CRASH IN.

Also both short programs produce convincing effects if Graphs 2 is changed to Graphs 1 or 3. Sample programs that great too. They kept my eye and I attended to a whole Sunday afternoon.
Christopher Muller
New Althorpe
Aberdeen

Chestnuts repeated

THE Winfield program in the first issue of *Commodore* Magazine was so well, but some points made in the last issue of Club Chestnuts. Needed need clarification.

Using shift & RUN SCOP to load a program results in the program being automatically run after it is loaded. LOAD (program) does not.

And programs to make the best of the VIC aspect are necessary, because POKE 630,230 will make all keys repeat. POKE 640 will return to normal — RUN STOP/RESTORE will not.

Keep up the good work with the magazine.
J M Demore
Preston
Chesh

Full advice will try to follow although it would have been helpful to have notes on the number of spaces in certain lists.

On the other hand the listing for Go into Space was very good, with the control codes being particularly impossible to read.

You will be interested to know of my problems with Visuale. I attempted to order some software on the 11th October. The goods were confirmed to stock and my Access card was dated on the 11th October. Despite numerous phone calls to find out what had happened only part of the goods arrived on 11th November. I have complained to Access about the changing of cards without despatch of goods and I understand that it is a company in transition.

To my mind the choice of computers at the moment is between the Spectrum BBC B and CDM 64. The BBC has a nice touch. The Spectrum has a large keyboard and so should not of the information, but lots of good programs. The Commodore was my choice despite the poor home — though if you get to grips with it you can probably manage anything.
D A Winfield
Dover
Kent

POKE takes on the things — and in an issue if Commodore still doesn't take the point about Visuale.

Take a tip

HERE'S some tips for Commodore 40 owners:
POKE 89 118 disables run/stop and POKE 89 207 disables it.
POKE 73 200 disables the hot command and POKE 73 107 re-enables it.
Pascal Poles
Dorset
South Dorset

This is the chance to air your views — send your tips, comments and compliments to:
Letters Page
Commodore Horizons,
15-15 Little Newport
Street London
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Vicsoft vexations

AS A reviewer my overall impression of *Commodore* Magazine was favourable.

Some of the listings were very good. For example Apple

NEWS DESK

Following up Falcon

STEVEN LEE, 34-year-old author of *Falcon Patrol* for the Commodore 64, is now planning his next game.

Previously called *Blade Runner* (it'll be released by Tynes Games at the end of January), but you, at the Hudson Bell of the 19th, must fight off a succession of attacks from nefarious ants.

Steve is also working on a follow-up to *Falcon Patrol* — predictably *Falcon Patrol 2*. Using the bones of the original but with added features and a new more difficult location, the game is predicted to be tricky.

Speech built into new 364

THIS summer sees the launch of a new Commodore home computer with built-in speech, the 364 — and how it and various map follow later.

As well as built-in speech, the 364 will offer 32K of system ROM, 44K of bank-switchable RAM, full-machine copy and a full-sized keyboard plus software support.

"The system is said to be 'very flexible making it easy to produce lower-end versions,'" For example, cutting down on the RAM and dropping the

speech module could produce a 332 or 318.

The good news is that the 364's ROM offers all the *Yo Super Expansor* commands. The bad news is that there are no sprites, and that *Yo* and its software will not run on the new machine.

The 364 uses Band 4. This is the version of Basic used on

Commodore's previous machines, as opposed to Basic 2 on the *Yo* and the 64.

The new series was shown for the first time at the Consumer Electronics Show in Las Vegas at the beginning of January — running a fairly version of *Expansor*.

It is expected to go into production this Easter.

On the serious side of software

COMPANIES both large and small are being attracted by the market for software with serious applications — programs for use in business and in the laboratory.

Software-based *Specific Software* has released a suite of book-keeping programs for the *Yo* and 64 while chemist John ICI is working for months to users of *Pets* and *64*.

Specific Software's suite of programs covers invoicing, Sales Accounts and Purchase Accounts. Each is available on either tape or disk for both the 64 and 64 while chemist John ICI is working for months to users of *Pets* and *64*.

For example, the tape-based version of *Sales Accounts* for the *Yo* does not include address label printing, which is available on tape for the 64 and on disk for both machines.

Prices also vary accordingly — *Sales Accounts* for the *Yo* costs £25.00, but runs to £39.95 for *Yo* disks. The 64 tape version is £25.00 rising to £29.95 on disk — this includes extra features such as cost analysis headings.

Purchase Accounts has the same price structure but the invoicing package costs from

£29.95 to £45.00.

The tape versions have a capacity of 64 accounts and 64 transactions while the disks offer 300 accounts and up to 2000 transactions.

ICI's three packages (*Formal RSP* and *Drugs*) are being marketed under the *Acquaint* title already used for its input/output interfaces. *Formal* versions are available now, but 64 units have to wait until March.

Tomcat at £450, is a calculating program which allows tasks to be written and edited independently before bringing them together within a common framework. Based on this framework, Tomcat supports micro-and macro commands changing priorities from moment to moment.

So far Tomcat has been used to control laboratory equipment, but ICI expects applications to extend to industrial control and into the household/hobbyist market.

The two other programs have a more limited scope. *RSP* (the *Research Statistical Package*) is used for processing and analyzing arrays of experimental data, while *Drugs* creates impact test materials.

Brush up on your painting



Acrobat Painter — *Acrobat Painter* is a more easy-to-use graphics

SOFTWARE house *Acrobat Painter* has moved into the peripherals market with the launch of a graphics tablet for the 64.

Called *Acrobat Painter*, the tablet allows users to produce full-color drawings and illustrations directly on screen.

The £99.95 package consists of the graphics tablet plus separate stylus, disk-based software and an instruction manual.

The software gives you a

choice of on-screen — commands, buttons and then finally color palette which offers a choice of 16 colors and 16 patterns.

The commands require almost zero to combine freehand drawings with previously saved designs and basic shapes included in the menu (bars, boxes, lines, etc.).

And further gives you a chance to vary the style of the illustration by increasing or decreasing line width.

Sounding off on the right notes

THE NEWS is good for music-playing 64 users.

Software house Quillex is releasing a music program Ultrayes 64 at about £15.00 while a keyboard has arrived from a firm company called Solyon.

The Macintosh 64, a full size, four colour keyboard plugs into the 64's cartridge port.

But software users may be disappointed as Macintosh musical notes played through the TR Modemaster. These notes can be stored in your 64 or saved on tape or disk for recalling.

Macintosh 64 also features nine other controls which operate a simple music synthesiser. And Solyon is developing more software enabling the £125 keyboard to produce more complex musical effects.

Macintosh 64 is available from Autographix, 3A Reading Rd, Haringey (a Haringey).

Spectrum hits set for the 64

TWO OF last year's most popular games for the Sinclair Spectrum, Vultalis and Maze Wars, will soon be available for the CBM 64.

Vultalis, the adventure from Legend Software which introduced the blocky graphic animation process, will appear in February.

Legend's managing director John Post commented: "The Commodore 64 version of the game will be similar to the Spectrum one, but obviously the graphics will be better. For one thing, the characters will be more than one colour, and we should also be able to do more with the backgrounds."

Like the Spectrum version, Vultalis for the 64 will cost around £15, and the new edition is expected to confirm its position as one of the most popular adventure games around.

Maze Wars, the much-



Pre-production screen from Legend's Vultalis adventure

estimated arcade-style game, should be an included bonus in the same time. Software Projects' CIB 64 program is an almost exact copy of the original floppy version for the Spectrum, regarded as one of the best 48K Spectrum games released last year. In Maze Wars the hero, Maze Wolf, collects points while avoiding attacks from varied opponents. Each of the 28 screens has been increased for

the CIB 64 version.

Programmer Chris Lawrence said that the success of the game was such that it was "thought necessary to radically redesign it for the 64, but there would be some changes to the sound effects."

Overall he claimed the game would be well worth its estimated £7.95 price, and should be in addition on the 64 as it has proved to be one of the Spectrum's

Rounding up the arcade games

CONNECTING is traditionally the time of year when houses make sure they have the new arcade games on the shelves — and last year was no exception.

Heading the pack of new releases were titles from Autographix, Arkis, Amstar and Commodore-owned PDS.

Autographix launched its series of dual cassette, with the role containing a Vic 26 program and the other a 64 version. First up were Chessmen at £1.95 and the re-released Bongo, at £1.95.

In Chessmen you command the first knight defeating the latter copy of Bongo from the tactics of the British empire. Bongo is driving the various results in Chessmen.

Bongo goes on in the role of a workman climbing ladders to collect bones from different levels of the screen. The bones are guarded by monsters which Autographix warn "do not just wander above the screen but actually try to trap you on a particular level".

For the 64, expanded Vic



Arkis's Maze Wars — rapid fire shots in space

Autographix also launched the Vic, which is presented "making Pac man look like the totally lame i game". The price of escaping the ghosts is £1.95.

Three new cartridges (Spectrum, Sealion and Chap 64) and one disk (Maze Wars) were listed at £4 each. Each costs £29.95.

In Maze Wars the snakes destroy your spaces while eggs and frags also make game

appearances.

As commander of the Sealion, ultimately you have to destroy a colony of ships. Chap 64 follows the military theme, but on land not in sea, as you pilot your helicopter to rescue besieged soldiers.

David's Midnight Maze, however, presents the more subtle pleasure of playing patball.

In a track to a world of new

video action at PDS. Its releases include Maze Wars (expanding the classic) Holy Duck (following an television) Nocturne (using the colonial planet) and Cosmos 64 (defining the cosmos).

The games from North Atlantic risk on the 64 and cost £7.95 each.

You may find Arkis's Tank Battle is tricky. The game runs on all memory versions of Vic and costs £3.95.

For users after more arcade flavor, Amstar's converted some of the Atari classics in cartridges for both the Vic and the 64.

Day Dog and Tanky Kong come in at the top of the range at £29.95 each. Pacman, Gomoku and Defender cost £24.95 while Robotron and Sargant are the cheapest at £19.95.

Don't miss out, however, but Amstar says that no games are "second to none, therefore the price is not too high in terms of the quality which you get."

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Magic moments from Commodore

Commodore's work on the software market continues this year, with Magic Voice, Magic Desk and Bookshelf — the follow up to Space — leading the charge.

Magic Voice, a speech synthesis unit at about £50 will be available early this year. It has a vocabulary of about 200 words which are entered by the command SAY "it".

Letters and numbers are also included, along with some outbursts for adding to words.

A number of talking games and educational aids are also on their way to run with Magic Voice — the arcade game Wizard of War and Golf, a series of talking books for school school children and some pre school package.

covering reading, arithmetic and thinking.

All except the talking books can be used without Magic Voice.

The users in search of education can turn to the series of six Four Pack programs.

The Magic Desk cartridge now expected early this year can also be used with Magic Voice. This is a small business package using features to represent an office and its functions.

The first UK release, Magic Desk II, often opening, color facing and filing facilities.

Also on its way for 64 users is Bookshelf — a follow-up to the acclaimed Sector. This is expected to be available late spring.

Adventures away



Island Mysteries a Commodore 64 title.

COMMODORE users in search of adventure are having their prayers answered by four languages — in addition to Commodore itself.

Buy here is released Two Kingdoms Valley for the 64. Combining text and graphics, the program is in the Robbin world with 170 screens.

After operating Island Mysteries has gone underwater for Neptune's Daughters — a multiple screen adventure for the 64 at £9.95.

Two other 64 titles come from Richard Shepherd Software, at £8.95 each.

Step at the Last takes you back to the 18th century and puts you at command of a Royal Navy warship crossing the Mediterranean.

Everett Avenue brings you back up to date and sometimes down with a bump. As you

plot your way up the ocean to you have to avoid undersea, pirates, other sea and shoreward enemies.

The fourth company in P&P whose Knights of Zang, at £7.95 provides 64 users with arcade thrills as well.

Commodore itself has not forgotten Vic users. A plan to release a wide range of adventures, as we revealed in our previous issue.

These plans include more Scott Adams titles on the Vic and 64 along with other referenced American games for the 64. Chief among these are Rhapsody, Doctor and the Zork trilogy — all from Infocom.

If you think you've something noteworthy, call 01-427 4242 and let us know



VALHALLA

commodore games cassettes

SUPER SCRAMBLE!

Personal Computer News (28-31 Sept '83) gave **SUPER SCRAMBLE!** an official rating of **NINETEEN OUT OF TWENTY** and described it as: "Well implemented with beautifully smooth scrolling and very nice graphics."

SUPER GRIDDER

"...a compelling piece of liveliness that could give hours of fun," was the verdict of Personal Computer News (28-31 Sept '83).

SUPER SCRAMBLE!

"An excellent game!" said Computer Video Games magazine (Sept '83).

STELLAR DODGER

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Mishits and bull's eyes in the battle for games users

Pete Gernard looks at the games available — and picks out some winners

LAST MONTH we looked long and hard at a selection of games software presented by Commodore for their own Vic 20 and C64 machines and found it to be a very mixed bag indeed. Now let us come to flesh off the Commodore game, then go on to review the opening shot in the software battle from other well-known companies including Virgin and Quicksilver.

Money Wars is an exceptionally game hiding behind an unassuming title, this one, like so many others, has its origins in the early days of the Commodore Pet in a game with the obscure name of *Rebels*.

Money Wars is has appeared for the Spectrum under the name of *Headbanger's Heaven*, and now the Vic version follows the same old rules.

You are in control of a little man who runs along the bottom of the screen, hidden behind three random-eyed skeletons. On the right of the screen is a bag of money, and it's your job to steer the man and get the money back to the left hand edge of the screen. At this point you go back for some more, and all the action gets just a bit to be faster and a little bit more dangerous.

To make life more difficult for you, the heavens have opened up, and from the top of the screen comes a perpetual shower of little arrows. Unlike a change from cat and dog it's supposed.

These arrows, should they land on you, usually cause death, so for the greater part of the game you're trying to dodge as and run from behind barriers while hiding from arrows in your defence, you can make your man run very quickly, and you can also get him to shield in either order, but both of these are no valuable because what so should be used discreetly.

This cartoonish game requires you to use the keyboard, which is good enough for the limited controls you have to play with. You are helped by two small holes which float about at the top of the screen making up the arrows, but after about the third money bag life is getting very hectic.

These arrows that are all absorbed and then don't hit the ground or you, crash into one of your three barriers and take a chunk out of it, and it isn't too long before your barriers begin to look very ragged indeed.

This game is certainly addictive, and manages to work new life into an old theme by adding one or two more little extras. Well worth a look.

Corinth

Corinth Wars What, you may wonder, is an *armet*? According to our source, *armet* is a Corvid word used to describe holiday makers, so this game about destroying *armets* ought to go down well in the west country.

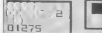
Whatever they are, they appear in a game that is essentially like *Tank Attack* and some superb machine code programming gives you an extremely responsive scrolling screen as you scan the horizon for the new wave of *armets*.

These *armets* frequently look behind jumbles of rocks and leap out as the last minute. But they appear to be fairly powerful, since they don't fire at you, they just keep advancing down the screen. When one of them reaches the bottom of the screen, the game is lost.

Recommended for players with nimble fingers, the *armet* game is an easy one to get to grips with, but shouldn't hold the attention of the devoted arcade machine.

The reason for this is that the action lets the scrolling screen graphics down badly. The *armets*, like *Corinth* holiday makers, move slowly about, and never seem to get very near to the bottom of the screen. This makes the steering of them very easy. Just manoeuvre your sight into position and bang! Another one disappears.

Getting rid of one wave of *armets* just brings on another lot, and as the game goes on, the *armets* don't appear to change their habits between levels, and they never get too close to the bottom of the screen. After 12 minutes of playing and waiting,



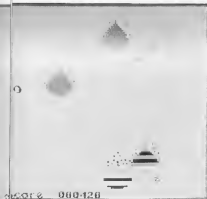
Money Wars is a fun game — but dangerous to the wallet



After three levels in Corinth — retirement is the goal



Always stay on your wheels through the forests



Commodore has written the first

freedom as it said the machine was switched off.

Of course, Commodore aren't the only company producing software for the Commodore 64. There others have recently brought out new products, and the price for the more garish publicity must go to Virgin Software, the Falcon Patrol.

Falcon Patrol I don't care whether the author of a program likes drinking and sex in country pubs, but Virgin insists that you know all these things, and so while waiting for the tape to load you can read all about Steve Lee and his interests and hobbies. But what is he like as a programmer?

Reasonably good, as the opening screen shows us. A line drawing introduction leads you into the game, which starts with you in control of a VTOL jet, able to move all the Falcon patrol, whose job it is now to defend the jet against the oncoming enemy missile.

To begin the game a non-graphical display shows the city in the bottom half of the screen, and a clear blue sky above. Your plane is just orbiting and topping up with missiles, you take off, and soon the radar finds the signs of enemy planes.

First disappears is an alarming rate as you wheel through the forests over an impressive scrolling landscape. You can refuel at any of your many bases, but this is a hazardous task as the enemy makes no bones about destroying you while you are there, like a lesson, drastically filling up with petrol.

In combat the movement of the planes is handled well, and the overall impression is that young Steve is a good programmer. The graphics and sound are handled nicely, and although you can only use a joystick to play the game, attempting to play it by using the keyboard would probably have been impossible.

In the first batch of software released by Virgin they were heavily criticised for the manner of many of the games, and the fact that few of them would have been released by any other software company.

They appear to be taking steps to correct this with Falcon Patrol, and if other games live up to the same standards, they could yet become a leading company.

Smashed

But optimism attached to Virgin's other game for the Commodore 64, **Smashed**, appeared on the screen. Oh well, back to the violence.

This game was written by a 14 year old called Aaron Kassin, so the Virgin that steel informs us, and young Kassin has obviously figured out how to generate your own characters on the Commodore 64, as most of the moving graphics feature home-generated characters.

The idea of the game is made more complicated than the game itself. You are made a data file that's what it says! Looking against the mouse flow. You have to reach the control zone by destroying all the bats that the CPU sends out at you. When they vary from level to level, but all have to be hit twice before they'll die.

One more feature is a panic button which sends you on to the next level and game.

keep a record of his aspect of *Popular Computing Weekly*, the system is ideal — well-ordered and most important, easy to use.

A subsidiary program called DPM Labels will allow you to print out mail-order labels from a DPM address list (think of those Christmas cards again, write well, and send out lists). DPM can't be beat.

Another DPM program is Journal 6110-10, which is essentially a financial diary. Its leading hand lists the account needs updating as it tells you what to load — JOURNAL, J2 — whereas any listing of the diary's record (if that's the program had been named "JOURNAL") you are greeted with a large title and the obligatory question "Is user ID required?" Studies of secret services and mystery — but no, it's not a way of identifying which journal you want as the software has provision for you to keep several different diaries of the same date of your wish.

The instructions are adequate, and the layout is very nice. Once you get into it, entering and deleting data is pretty easy, but to be honest I question the necessity of having a computer diary at all, as it really is easier to write it all down in a book. Having said that, if you are involved in some of money then the addition and subtraction facilities are handy in it's all arithmetic (of course). After all, that's what computers do so well.

Some people do find databases difficult to work out for themselves but be thankful one of those people used to be me! and so DPM has made two packages similar to DPM, but with already defined fields, and a rather nice graphic screen display so that you can imagine you are using a standard form on paper in a book. This is really taking me frustration to the maxims, and of course you lose security as your fields have already been defined, but for the casual collector of information (such as a catalogue of articles or a collection of records) who doesn't really understand how to use the database this site is perfect.

Similarity

Although the two packages are very similar Catalog is, to my mind, the better. On LOADING you are presented with a screen format which resembles a box containing field headings and 16 screens for your apparatus reminds The sample data on the disk is called "ALPHAS". It is really a catalogue of LPs with the title, artist, number and characteristics followed by a listing of the tracks on each A and B. It is only used by the other program, Datalog, has only eight screens but has four titles which you can name yourself. This is most useful for cataloguing magazine articles as you only have eight screens but if you catalogue numbers are involved then it might be a better system for you.

The actual procedures involved in both are similar involving less trial and error (entering of records) both are reasonably good (6110-10 for Datalog and 6110-10 for Catalog) and are pretty versatile. In both cases instructions for entry and moving around the programs are included which

should make them not totally easy after about 10-15 minutes (depending on previous experience).

Features that particularly appealed to me were that you could alter any entry system (SHIFT plus RETURN), move quickly past various sections (just keep pressing RETURN), alter data and headings at any time, and press F at any time to avoid repeatedly pressing RETURN. These are all features of software that has been field tested so that little snags have been corrected.

Of course, you can enter and delete data, amend it easily, sort and search, and of all the usual things. One nice touch is that whenever you make a move that might wipe your data you are reminded that you can SAVE to tape or disk — helpful for people like me who tend to have their minds on higher things at times and inadvertently press the wrong button again. PRINTING is also fairly versatile, allowing you to print out the whole file, or just selected records in any order you like. Also both have the facility to check and see how many bytes of memory are left each you get sent to "filling" your record up although there is a bit of a limit (due to the work on maintaining messages to keep you happy that the program hasn't crashed).

Amateur

The Mark with the disk (rather suitably) I feel claims that there are a whole lot of possible applications such as having accommodation a contact notebook, travel guide and timetable. Whilst it is true that some possible applications, I still think a good notebook may be the quietest and easiest for most of us. But then it's quite a big book where the software is handy in the way it is made and easy. For me that is the real advantage of any computer. They storing articles from a journal. You must all know the frustration of searching through a pile of back issues looking for one particular article. Well, had you stored all those articles some thing like Datalog that it would be a simple matter to call up the file and search for a keyword such as "CAT" — and there it would be on the screen.

However the problem is that it takes quite a lot of half-measures to keep entering all these articles week after week for ever more to sit down after an evening and enter the lot. And that, really, is the snag with this software — to make it work you do have to keep entering the lots. But if you can do that then these two packages are both good value.

As I mentioned earlier Datalog is planning a phase 2, which may well be available by the time you read this. For my money that is where the really exciting stuff comes in for doing three things — to keep watching the adverts or contact them down (19 Values Gardens, London WC1H 9LL) that if you are still a tape-only event and thinking of expanding your computer a little then the existing programs are an excellent option too into the world of databases. But, as with all software — the best advice is for you to sit it and decide for yourself whether you could use it. ■

■ But as the new 6110-10 is too far removed from the previous one, you might as well move where you are.

This is a continuation of the great Christmas, only without the great Year's little day as more on the screen a little way, and has total mobility on left and right directions, but is a lot slower when it comes to sending out the death destroying bullet.

The explosion when you die are not satisfying, and the graphical display is a good. Plenty of what-look colors, all sorts everywhere, and worth having a few lives for.

But, and it's a big but, the game is very tedious to action. Keyboard only, the graphical display of defined graphics has been handled better by other games, and you have that starting about the screen looks like against the background of everything else. One could almost be happy for finding away for the more, and having fun here.

Values

Colliding with an alien reveals that they are all in one, and light, as another life values in the astronomical graphical procedure.

I had some of Purple Turtle being the result of some drag-and-drop game-winning screen, but in reality it is a very good computer game for kids, and anyone who has the instructions from Quakebox tell me it is going to be.

In the case of blowing about on the River, the instructions are displayed on the screen before the main contents. You are told that you're going to include in the sport of turtle fishing, as indicated by the extremely nice purple turtles.

These turtles float happily about in the river, and it is your job to control a little boat, make them jump from turtle back to turtle back, and get over the other side of the river where some getting from across you at a reward. You then have to get back again with the first, and when you do, drop it at the foot of a little tree on the river bank.

An owl on the river jumps up and down with delight, and you have to go back and get some more. Up above, the blue sky has a cheerful sun beaming down on you, fairly warm and black clouds drift by, and from time to time a balloon floats across the sky.

Purple Turtle is a good close game, and makes such a change from shooting alien and using the screen. There are some levels of play. The difficulty comes from getting where the turtles are going to stay at the top of the river, in which case you can keep across them, and when they are going to jump down to the bottom, in which case you'll jump over the river and die.

The only disadvantage about the game was the graphical display of your boat, to the rest of it is, well, the only words have got to be — so cute.

A cheerfully adequate game, and anyone with kids might like to have a copy (even if you haven't the change from zapping aliens in going turtle fishing is a hard one to make). The rest of points that makes the one close on many close.

Quakebox's move back into more. ■

Disk drive delights



NOW THE 30 owners have to, although older rats were given the choice. Commodore 64 owners can do what they feel like, as long as they don't mind parting with an unreasonable amount of money.

What are you waiting for, yourself, or have the choice faced upon you, anyone who is using a home computer. For whatever application, will sooner or later have to face some means of saving information.

With the popular Vic 20 Starter Pack it is assumed that you are going to be using a cassette deck, since this particular item is included in the package. For a Vic 30 this is a fairly safe assumption to make, not every Commodore would pretend that this computer is a videodiscer in the business machine of the past," makes a 32 column screen and a pretty 1.5K of usable RAM combine to put this machine in the pretty beginner/hobbyist ranks.

However, if you decide that you would like to use a disk drive, there are a number of options open to you, and later on we'll take a look at some of the more popular drives currently available.

For Commodore 64 owners the choice is there; you can buy a cassette deck at the fairly high price of \$49.99, although there are currently difficult to come by, presumably because all of Commodore's stock is being used up on the 30 Starter Pack! On the other hand you can choose cassette and the bank balance to the winds and go out and purchase a disk drive.

The first of all why buy a disk drive anyway? That is what the question, your disk drive can certainly not change. As general, Commodore's recommended drive for both the Vic 30 and Commodore

HARDWARE REVIEW

Take Commodore look or life in the fast lane

64, the 3540, costs around £129.99. There used to be two different drives for per machine, and the original Vic drive was intended to work with both machines.

The 3540, as we all now know, wouldn't work with the 64 when it first appeared and a new one was rushed out to bring. In the meantime a few enterprising dealers managed to make a fast buck by charging users more a large amount of money for installing a small amount of ROM chip in the original 3540 drive.

There are other drives available, including the entire Commodore range of drives for the 800 series of computers. 7.5 megabytes can be yours for a cost of just £12,990, although it is debatable whether anyone would spend 12 times the cost of the computer on a disk drive.

The advantage of disk drives should be obvious to anyone with the slightest interest in computing, and having spent a couple of hundred quid on buying a computer it must be assumed that you have at least a taste for about the business.

Consider the time and the space only a limited amount of information. For anyone performing any sort of file handling, cassette is a virtual no-go; random access is impossible, and only sequential access can be used. This is the difference between records and tapes: a record can play any track you want to simply by moving the slider to the track in question, whereas a tape has to wind through the rest of the

length before reaching the required one.

There are disadvantages to disks. Tapes are easy to copy, as anyone with a real disk mass system will testify. Even those little microcassette tapes of dubious whether the play button is a still depressed on the cassette deck after the program has finished loading can be compromised by quick rewinds and a pair of scissors.

Disks are much harder to copy, they also (individually) cost a lot more, but if you are intending to use your system for any kind of serious use disks it has to be for what are the kinds of drive currently available?

The aforementioned 3540 is a 170K single drive unit. You don't see both sides of a disk if you are brave enough (I've been doing this with Triskaide 124140 disks for some time now, without any problems... yet!) but most people remembered that you stick in using just one side of the disk. This drive has the advantage of connecting directly to the RS 232 serial port at the back of the 64 or Vic, and having two disk ports on its own back. One connects up to the computer, and the other for further daisy chaining of disk drives or printers.

A word of warning though. Commodore states that you can supply drive chain disk drives to your heart's content, and transfer programs quite easily from one drive to another, provided that you change the device number of each drive beforehand. How can change the device number by using the following series of commands:

```
GDVD=15,15  
PRINT "15" M M CHS 01514CH 0150  
CHR$(15)CHR$(15) = (PTR) H 0150 = 0150  
C L 015 0 1 1
```

where 015 is the new device number. ▶



Commodore Computer Systems' double-drive unit — sophisticated but simple.

Q Two weeks to go! Is your particular drive, a cheap MSX model Agate you back to drive number 8 again?

A Yes, it's all very well, but it doesn't always work. Two people that I know can now easily go buying disks out of the 4040 shop at the 84 by attempting to link up two different 1341s, following the recommended procedure.

If you don't happen to know a friendly dealer who'll take 1 year of Commodore off you in exchange for a new chip replacing the well-worn one a fair amount of money. This includes not only the £13.50 (or £23.00 or whatever price your dealer cares to quote) cost of the chip, but also the fixed service charge that is included for work over the highest amount of time regardless of whether the job takes one minute or 50.

Apart from this odd habit of misbehaving every now and again, at least the disk drives work. They are slow, but they do the job that they were designed to do. That is, provide a reasonable storage facility for an inoperative page.

But what if you want to store more than 778K? So do they will not only reject buying a more expensive disk drive, but it will also reject a buying an external diskette baggie.

Communicating

To share with interfaces first of all, there are a number of units currently available that allow your Vic or 64 to communicate with IEEE 488 standard on all Commodore's other drive devices, Commodore, and others.

For those of you who desire to connect up to IEEE drives, the most expensive interface currently on the market is probably that available from Oxford Computer Systems (which lives at Hemmings Road, Woodstock, Oxford, telephone 0893 412700) at a price of £99.00. This has been recently reduced from £125.00, but even so it is still bordering on the pricey side as allows a Vic or a 64 to control up to either IEEE or RS 232 devices.

Now you may be wondering why anyone should produce a unit like this given you its £2532 signal when the two companies already have one on board. Well, in this case, as in many others, Commodore states a word of my gaw which is count in a saying

standard — perfectly. In fact Commodore's RS 232 drive, shown in much resemblance to the real thing in Dan's Darn door to Northover.

The Oxford device is known as Interpod, and plugs into the back of the computer leaving a number of sockets free on Interpod itself. There are the aforementioned RS232 and RS 232 ports as well as a Commodore RS 232 port to allow you to connect to other Commodore peripherals.

No doubt about it, Interpod is a sophisticated device, and in fact is totally comparable to the unit. It doesn't take any guesswork from the computer as allows you to talk to all these strange drives, and has a number of built-in commands all of its own. However, it is impressive is also to that of a Break Bad dog, most of anything can go wrong with it, and still those often does not is simple LOAD/SAVE from disk will cause the entire system to go to sleep on you, and it will require a reset of at least Interpod (and in a hell over the complete computer setup) before the computer will talk to anything again.

If sophistication is what you're after, then buy Interpod. But there are less expensive options. For example, Data in Glen Road, Kirby Industrial Estate, Liverpool, on 051 540 7111 produces a cheaper number for both Vic and 64, at £29.95. This is purely an IEEE interface, and so it plugs into the cartridge slot of the Vic or 64 to connect to get on the way of some commercial software is demand to use a running version of the setup you're after before paying with any money.

Others are available — for example from Impex (Oxford House, Second Way, Wilbury, Middlesex, on 01-880-8899), Memory 034205 Route 15, Butler New Jersey 07045 U.S.A. (on 0603) 200 225 9077) and Analogix (34 Crown Street, Reading, Berkshire, on 0733) 862334. However, these you'll be able to go on over time for anything from a disk drive to a tape processor.

But back to disk drives. There are a wide range available from Commodore and and an extremely small range available from everyone else to find in fact that hardly anyone in the country is supplying anything other than Commodore's own disk drives.

The Commodore 4040 is a double drive unit, with each drive giving you a capacity of 170K, single sided. The rate of price you can expect to pay for this unit varies enormously, but you won't get much cheaper out of about £200 unless you're buying secondhand. I've seen one person offering a 4040 for £200.00, so it's worth looking around.

But there's always a hell the drive does not have the latest version of Commodore's Disk Operating System shown in Disk II, since that's what the drive needs to do what wonders for a Disk II. And writing, say, a software record program with the disk is difficult, to say the least.

The dreadful 2041 should be ignored. That is a 4041 that has been changed in fact, but unfortunately the new disk's control circuit has not, and it comes on an expensive single disk drive for the time you're bought the software interface Disk II, or Oxford Computer Systems, you'll have paid out about twice the cost of your computer — so you might as well have bought the 4040 in the first place.

Big brother

Big brother is the 4040 in Commodore's 6500, another double drive unit, but this time giving you would half a megabyte per disk. This has 1000-words 2.5 in a disk in it, and with a whole range of special disk commands to allow the user to easily create a random access system.

It will cost you a big price money of course, around £400.00, but for a megabyte of memory and random access, anyone considering using a Vic or 64 in business would do well to use the secondhand volume for a knock down price.

There are bigger drives, notably the 4210, a double-sided version of the above, but the price goes to well beyond the level that even the most ardent computer enthusiast would consider, so you'd be well advised to stay clear of them.

Well, as we've already seen there aren't too many independent drive's about (although a number of companies are now beginning to evolve the technology behind the drive's disk). All the ones that I've already mentioned use the standard drive and a quarter inch disk, but several companies like IFL, Kentfield (on 0605) 33444) and beginning to use the smaller three inch disks. This one has not produced one for a Commodore machine, but it can only be a question of time.

Storage Computers a drive between a disk and a tape, are also slowly coming onto the market or to the attention of some manufacturers, but their reliability, as yet unproven, and their availability is very restricted.

So if you're going to add a drive to your system, you might as well make it a Commodore one. They're not the future in the world, but they do work with Commodore's computers and their prices are lower than other manufacturers' machines capable drive.

When microdrives and storage floppies become available, as most, we'll let you know. But until they do, here's the deal you know. ■

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Llamas at speed the Minter way

Graham Cunningham talks to Jeff Minter — the man behind *Gridrunner*, mutant camels and many others

YOU'VE SEEN THE Bunsen and the camels — now meet the man who runs the grid. Llamasoft's Jeff Minter. The first computer for your game screen was a Commodore machine, but it was a Pet, not the Vic 20 or C64 or 64 which he's since become a master of.

Jeff studied computers at with farm college in 1978, teaching himself Bunsen on loan in five months. But he doesn't recall the time with much fondness. "We were taught a dead boring dead low level schools language called Crol, he says. "We didn't get near a keyboard, the programs all were away somewhere else and we got printers back. And we had to do silly things like follow a convention but the square O should be crossed rather than the number zero." The hidden away at the back of the classroom was a Pet and Jeff eventually got to grips with it, working on from Basic to machine code.

This was the time when Space Invaders was still a rage, although Jeff had his sights on something higher. He lives in Hampshire but the comes up to London to visit the arcade where he discovered Star Fire — "the first third person space game I'd seen, where you were actually sitting in the ship". So he snuggled up his Basic screen of Space Invaders and moved on to machine coding Star Fire using borrowed books and modified monitors without assembly. By the time too Jeff had bought his first computer, a ZX80 — "then saving up for months".

Get the job

But his programming was advancing and of top with his academic career. College may have introduced him to computers but it didn't allow him to take an A level course which helped. As a result at university Jeff had to do mainly physics and maths "which I hated" — "I failed up the maths and so I had to go. Next stop was Oxford Polytechnic — for a more computer oriented course". Jeff also made another move — his first big upgrade — from the ZX80 to a ZX44. Now the rate was divided between poly maths during the day and graphics

programming for 150 hours at night.

Then came another change of direction. Jeff caught a virus which put him out of the poly school but "turned out to be one of the best things that ever happened to me. Six to months ago it was more a case of 'populated Jeff' than 'Minter Minter' — but then the Vic 20 arrived. Jeff bought one of the first ever Vics and he's still using it now. The reason he likes the machine was the "nice keyboard, good colour and the fact that I was familiar with Commodore machines". Then he wrote his first machine code game in coming up under his own label, Andon Attack from Llamasoft with the South American accents in claim claiming the Pervious computer.

Animals

Camels had been Jeff's favourite animal at school, and he's going to Egypt this year to see them in their natural habitat. But now he prefers Bunsen. — "They're funny and usually move slowly although I've also got a minority interest in sheep and goats". Llamas have been used in traditional Peruvian designs for more than 1,000 years. Now they'll be appearing in a newly designed code page for all the Llamasoft games in a mix of grey, beige and dark brown colours. As Jeff works he is surrounded by the same motif — on rug, cushions and on his jumpers. Jeff was also delighted to read that one of the designers of the original Apple logo a herd of llamas. Camels have not been forgotten though — no sign of Jeff's most recent purchase a four-foot high model of one — and other members of the South American camel family may appear in the future games.

Andon Attack itself is a version of Defender, featuring Jeff's love of the arcade. It was on display at the Commodore show in summer 1982 caught the eye of an American company, Human Engineering Software and now that the Bunsen have never looked back. Next up was Truxo — "the first of the platform games which there's so many of now".

Jeff admits that Andon Attack and Truxo both show their arcade roots but he means



Jeff Minter at the Bunsen. On the left is the

that originally is the last in writing a good game. He still wears the clothes which he has in London but he may go back, not when makes a game good rather than just copying it. His latest machine — the first in its class but don't put a point what they've heard. And anyway Jeff said.

Copying is boring. It's the fun in doing another Country kind. He thinks that it's now about that it could be, although — no arcade people should not the copies. He's now too pleased with to see certain aspects of his game, ordered to other local companies and UK games incorporating features he originally wrote.

After Truxo came Andon Attack — when you shoot the alien as fast as you can. — Followed by the program which has made Llamasoft a household name among Commodore gamers. Next Defender. Spent was again the source. Jeff explains that he wanted "to do something very, very fast for the responded Vic". He thought



Jeff with model camel — but one day there will be Jeff himself in the garden as well

However, this has advantages. As Jeff points out "it will definitely be a different garden."

The Laser Zone convention was followed by Harry Dover on the 14, with Jeff's attempt to check some of his new growing ever stronger. In Home Haven you have to mow 16 lawns while avoiding the owner of the house you've borrowed. The immediate lawn is a hard Jeff stayed in during a show inspired the game. Almost immediately he had his father devised most of the ideas for the frames, one of which designs a lawn mowed around the shape of a lion.

It was back to the 14 and the Vici 20 for the next game, Metaphysical Llama Bards at the Edge of Time. As Jeff explains "I usually go from a 40 game now to one on the Vici and then back to the 14." So then up was Revenge of the Misanthrope for the 14, launched at the end of his year.

As the name suggests this is a sequel to

Attack of the Misanthrope which came out between Godfather on the 14 and Mantis. There's 42 games in Revenge and each has to be played differently each time. Jeff thinks that this randomness is one of the features of his games. He argues "You could teach a robot how to play games like Misanthrope on the Spectrum because each version plays the same and you're motivated." Although he adds that Misanthrope itself is "very well programmed."

Making Weapons

In Revenge you, as the camel thief, find a range of weapons. Among the rest of weapons and destructive weapons are axes and maces, missile weapons, nuclear weapons (the Camel is good news), diving kamikaze bombers and rocket grenades (black and roll up), mountain goats ("from my library in Cymru", spontaneously exploding sheep, sheep pooping but in joy and eating the flesh

down on you and sometimes if I've done a lot of physical research into the number of ways a human can fall off a wooden board). All in all, it's a game "where everything turns out something else."

Revenge will be followed by Hall Guts and then Jeff has his eye on a 100 space game for the 14. He promises that "the new game will be at least as good as the old ones, probably better." Looking further into the future, he's keen on the new generation of game machines, promising quality and top-to-bottom each one — "you'll be able to see each bit on the screen's eye."

An extension has already been built into Jeff's parents' house to handle his growing range of maces, battery of arcade games, and collection of Persian vases. He turned down an offer to move to the US — although the parents certainly tempted me — so the next step is a house of his own — and he vows that then there will be flames in the back garden. ■

Amateur group with an international cast

Organizer David Israel introduces EP400 and makes
 attendees aware of ways to make the most of its facilities.

AS THE name suggests, ICPUG (the Independent Computers Products User Group) is an independent club

starting for all those who own, have access to, or are interested in, a computer made by Commodore.

The club began in 1978 with only one machine to support, namely the Pong. And it was then known as the Independent.

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Mathematics and Computing
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Higher Education, Wellington
50 South Park, Teaneck
New York 10960
and 1000 10th Avenue
New York, NY 10019

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Great Telephone 0090 4880
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1400-15 or 1500-1100. Send us
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Andrew Brown to George

Manager: Roy Cooke. *
Social Hour: Prinefield Home
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 second Tuesday of each month at
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Representative North State's Regional Group Home Care (99 York Rd., Portsmouth, Hampshire 02874) will accept any child Wednesday of each month at 70 Acacia Rd. Southwold, Massachusetts.

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When introduced, on the last Wednesday of each month at the Florence Mental Association Board Room, Monday, June 1, 1908.

Fort Lauderdale, Fla.—Watford Regional Group Stephen Robinson, vice president of Group Insurance Group Ltd., La Jolla, Calif., Watford (N.Y.) Meet on the second Monday of each month at the above address.

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Rita He Chastened Drew,
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 Mainstone Cove Telephone
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Interview: David Jones, 197
 Station Rd Bus, Thompson
 Clevedon Busstop, Lane
 Meet every third Thursday at
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 Telephone Clevedon 3444
Interview: John Hughes 72
 Ashurst St. Salford
Interview: 1970-1971 trying to
 form a group.

London: Billy Wilson, Broomers Garden Department, Polytechnic, of North London, Holloway Rd. London W1. The group of the RLC which were very active Tuesday at the Polytechnic of

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Pauline is an African American woman in her 40s who is currently unemployed. She is a single mother of two children, a 12-year-old son and a 10-year-old daughter. She is currently living in a public housing unit in the inner city of Chicago. She is currently attending a community college and is working on her associate's degree in social work. She is currently receiving financial assistance from the state of Illinois through the Temporary Assistance for Needy Families (TANF) program. She is currently receiving counseling from a social worker at the community college.

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Users Caping. Now, we cover all the other machines as well such as the Wic 30, 64 and 700. This was reflected by the change of name last year.

MCOPG is a truly inclusive club run by all officers, committee members and other volunteers in their spare time. In spite of this, it may be because of it, the club has become renowned throughout Connecticut for its excellent male. The quality and quantity of its membership is well known and the latest copy will always be seen as a prominent possession on the desk of many a Connecticut executive. Our historical reports are maintained by the committee, past and present, as a means of valuable information concerning any

The relationship between HPINC and Commodore is one of the best existing between any user group and its associated manufacturer. The fact is, highly proved by evidence and information. First, consider both ways:

ICPUS publishes an newsletter a year packed with information on new programs and hints concerning all things Commodore. It also has a technical advice section, lists a library of public-domain software, supports an ICPUS list on ProNet and Microsoft, provides personal advice columns on machine code, and more items on all major computers on both lines such as the Pal Sharp, PCW, Sharp and others throughout the year.

ICFRI supports the setting up of local groups which now cover most areas of the country. We are interested in hearing from anyone who would like to start a new group — and funds are available to assist in this.

To see how many clubs there are just look at the list published alongside:

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If you want your club mentioned on this page write to: **Clubsnet**
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12-13 Little Newport
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SW16 6NR

```

0 REM
1 REM ALIEN ATTACK
2 REM
3 REM BY J.R. WILSON
4 REM
5 REM ON VICE20 HIGH RAM
6 REM
7 POKE 36879,15
10 SC=250:PEEK(6480)
20 CL=37000
30 IF SC=4896 THEN CL=38400
40 HS=0
50 HSB="VIC"
60 BDR BX(20),VC(20)
100 G=0
110 SP=20
120 X=0
130 D=1
140 PRINT"***** L I E ***** T T A C K "
150 PRINT"***** SCORE" :HS
160 PRINT"***** " :HSB
170 PRINT"***** INSTRUCTIONS ? "
180 GET#
190 IF #="Y" THEN 5000
200 IF #="H" THEN 100
300 C=0
310 PRINT"SCORE : "S
320 FOR I=1 TO 30
330 X(I)=RND*(RND(1)+7)
340 Y(I)=RND*(RND(1)+20)+22
350 NEXT
360 YB=0
370 CB=0
1000 R=PEEK(200)
1050 CB=0
1010 IF R=30 THEN B=-1
1020 IF R=20 THEN B=0
1030 IF X=0 THEN B=0
1040 IF X=20 THEN B=-1
1050 POKE30+X+22,B
1060 X=X+1
1070 POKE30+X+22,0
1080 POKE CL+X+22,0
1090 IF R=15 AND YB=0 THEN XB=X YB=2
1090 C=C+1
1100 IF C=SP THEN 1140
1110 C=1
1120 IF V(SP)=0 THEN SP=SP-1
1130 IF SP<0 THEN SP=0
1140 IF YB=0 THEN 1200
1150 POKE30+XB+YB+22,C
1160 YB=YB+1
1165 IF YB=23 THEN YB=0 POKE36879,0 GOTO1200
1170 K=PEEK(SC+XB+YB+22)
1171 IF K=230 THEN YB=YB-1 XB=XB-1
1172 IF K=100 THEN 2000
1173 IF K=220 THEN YB=YB-1 XB=XB+1
1180 POKE30+XB+YB+22,40
1190 POKECL+XB+YB+22,C
1195 POKE36879,230+YB+0
1196 IF CB=0 THEN CB=1 GOTO1140
1200 IF YC=CB THEN 1300
1210 IF RND(1)>.2 THEN 1000

```

Air war special on the Vic and the 64

STAR GAME

Alien Attack

Destroy the aliens
with John Wilson

ALIEN ATTACK is a game program for the Commodore Vic computer which requires more than the normal 16 KRAM. The program has written on a Vic 20 16K RAM pack, but it should work with a lower memory expansion. Before I go into how the program works, I will give a brief description of how to play the game.

You take control of a spaceship at the top of the screen and must defend your planet against the invading aliens. The alien fleet will appear at the bottom of the screen and



will always move towards you. Your ship is armed with a single laser cannon that can be fired downwards by pressing the **DOWN** key. As your ship is steered by spaceship computers, it will continue to move in one direction until it reaches the edge of the screen, or you change direction. This can be accomplished by pressing **Z** to move left, or **X** for right.

To destroy an enemy ship, you must hit it on the middle; otherwise your laser beam will bounce off the shielding, covering the rest of the ship. As the alien ships only have short range weapons, they will only shoot when within range. Unfortunately, once fired, the enemy missile cannot be avoided, and your ship is destroyed. You gain points for destroying alien ships, but your score is reset to zero if you let any ships through to your planet. As the game continues, the alien ships move faster and faster until they reach an incredible speed, and it is no longer possible to avoid the fleet.

In order to play the game, you do not need to know how the program works, but for those who want to modify the program I describe the main parts overleaf. ■

```

1220 VIC2=3*INT(ORND*1287)
1230 VIC2=INT(ORND*12)*125+22
1300 A=YVIC2*222+50*VIC2
1310 VIC3=YVIC3-1
1315 IF VIC3=2 THEN 3000
1317 IF VIC3<15 AND VIC3>1+50 THEN 4000
1320 IF VIC3>20 THEN 1000
1330 POKER=32 POKER+1.32 POKER+2.32
1340 POKER+22.32 POKER+23.32 POKER+24.32
1350 A=A-22 B=A-50*CL
1360 POKER=233 POKER+1.169 POKER+2.223
1370 POKER+22.183 POKER+23.182 POKER+24.95
1380 POKER=2 POKER+1.2 POKER+2.2
1390 POKER+22.2 POKER+23.2 POKER+24.2
1400 GOTO 1000
2000 S=0-5
2010 FL=0
2020 FOR I=1 TO 50
2030 IF VIC1+5=40 AND YB=YVIC1 THEN FL=1
2040 NEXT
2050 A=50+X*ORL3+Y*FL*22
2060 PORT3=875.9
2070 POKER=77 POKER+1.64 POKER+2.70
2080 POKER+22.75 POKER+23.66 POKER+24.77
2090 FOR I=1 TO 2000 NEXT
2091 Y*ORL3=0
2092 PRINT"SCORE ";S
2095 YB=0
2100 POKER=32 POKER+1.32 POKER+2.32
2110 POKER+22.32 POKER+23.32 POKER+24.32
2120 GOTO 1000
3000 S=0
3010 PRINT"SCORE 0"
3020 POKER=32 POKER+1.32 POKER+2.32
3030 POKER+22.32 POKER+23.32 POKER+24.32
3040 VIC1=0
3050 GOTO 1000
4000 FOR I=YVIC2 TO 1 STEP-1
4010 A=POKE(30+50*I*22)
4020 POKE30875.250-140
4010 POKE30+50*I*22.90
4020 POKE30+50*I*22.3
4030 FOR J=1 TO 1000 NEXT
4040 POKE30+50*I*22.8
4050 NEXT
4055 POKE30+50*I*22.214
4060 POKE30+50*I*22.4
4060 FOR I=1 TO 10
4070 POKE30+50*I*22+1*22.255
4080 POKE30+50*I*22+1*22.4
4090 POKE30+50*I*22+1*22.327
4100 POKE30+50*I*22+1*22.66
4100 POKE30+50*I*22+1*22.4
4105 POKE30+50*I*22+1*22.4
4106 POKE 30875.1*5+130
4110 FOR J=1 TO 1000 NEXT
4120 NEXT
4130 FOR I=1 TO 10
4140 POKE30+50*I*22+1*22.32
4145 POKE30+50*I*22+1*22.32
4150 POKE30+50*I*22+1*22.32
4160 FOR J=1 TO 1000 NEXT
4170 NEXT

```

```

4190 POKE 36875,0
4195 POKE 36876,0
4200 PRINT"*****YOU HAVE BEEN DESTROYED"
4210 PRINT"AND YOUR FINAL SCORE WAS"
4220 PRINT"*****S*****POINTS."
4230 IF 5045 THEN 4580
4240 PRINT"*****FURTHER GIVE 1"
4250 GOTO 4580
4260 IF 88="V" THEN 180
4270 IF 88="H" THEN 4250
4300 PRINT"*****GIVE 5V5."
4350 PRINT"*****"
4360 END
4580 GOTO IF 88="V" THEN 180
4510 PRINT"*****THIS IS THE HIGHEST"
4520 PRINT"*****SCORE SO FAR. ENTER"
4530 PRINT"*****YOUR NAME."
4540 INPUT 88$
4545 H$=3
4550 GOTO 4340
5000 PRINT"*****ALIEN ATTACK"
5010 PRINT"*****"
5020 PRINT"*****DEFEND YOUR PLANET"
5030 PRINT"*****FROM THE INVADED"
5040 PRINT"*****ALIESS. YOU CONTROL"
5050 PRINT"*****THE TOP OF THE SCREEN"
5060 PRINT"*****AND MUST STOP THE"
5070 PRINT"*****ALIENS FROM REACHING"
5080 PRINT"*****THE TOP. 5 POINTS ARE"
5090 PRINT"*****GAINED FOR EACH ALIEN"
5100 PRINT"*****DESTROYED. BUT YOU"
5110 PRINT"*****LOSE YOUR SCORE IF AN"
5120 PRINT"*****ALIEN REACHES THE TOP."
5130 PRINT"*****YOU TO DESTROY AN ENEMY"
5140 PRINT"*****YOU MUST SET A DIRECT"
5150 PRINT"*****ON THE CENTRE,ANY"
5160 PRINT"*****OFF-CENTRE HITS WILL"
5170 PRINT"*****BE REFLECTED OFF THE"
5180 PRINT"*****SHIELDS."
5190 PRINT"*****PRESS A KEY"
5200 GOTO 4580
5210 IF 88="V" THEN 5230
5220 PRINT"*****THE ALIENS WILL"
5230 PRINT"*****SHOOT AT YOU IF THEY"
5240 PRINT"*****COME WITHIN RANGE OF"
5250 PRINT"*****YOUR SHIP. TO MOVE THE"
5260 PRINT"*****SHIP, USE THE THESE"
5270 PRINT"*****KEYS Z LEFT"
5280 PRINT"*****X RIGHT"
5290 PRINT"*****RETURN FIRE"
5300 PRINT"*****YOUR SHIP WILL MOVE"
5310 PRINT"*****IN ONE DIRECTION UNTIL"
5320 PRINT"*****YOU CHANGE TO THE NEW"
5330 PRINT"*****DIRECTION OF MOVEMENT"
5340 PRINT"*****OR YOU BOUNCE OF THE"
5350 PRINT"*****SIDES OF THE SCREEN."
5360 PRINT"*****PRESS A KEY"
5370 GOTO 4580
5380 IF 88="V" THEN 5370
5390 PRINT"*****"
5400 GOTO 5000

```

Program notes

- 1 Set variables to maximum
- 10 to 30 Find position of screen and adjust memory
- 40 to 50 Set up high score
- 60 to 120 Set up initial variables for each game
- 140 to 160 Print title and high score
- 170 to 200 Print instructions if that is required
- 300 to 370 Set up variables for next wave
- 1000 to 1080 Your movement
- 1090 Your firing
- 1090 to 1180 Find next alien to move
- 1110 to 1130 Increase speed of aliens
- 1140 to 1190 Move your own ship
- 1200 to 1250 Add a new alien to the fleet
- 1260 to 1480 Move alien ship
- 1500 to 2120 Destroy alien ship
- 2000 to 3000 Alien reaches top of screen
- 4000 to 4050 Alien shoots at you
- 4050 to 4140 Explosion routine
- 4200 to 4250 Print final score
- 4340 to 4380 Play another game if required
- 4500 to 4550 Your score is the highest
- 5000 to 5400 Print instructions

Variables

- SC Points to start of screen memory
- CL Points to start of screen memory
- H\$ Highest score so far
- H\$S Person who got this score
- N\$N\$ X-position of enemy fleet
- N\$N\$ Y-position of enemy fleet
- S Your score so far
- SP Number of ship steps in the fleet
- N\$N Your x-position
- D Your direction of movement
- A\$ Control input
- C Counter to show which step is no more now
- I Control looping
- Y\$ Y-position of laser beam
- CC Flag for laser "bounce"
- A Keyboard input
- N\$N X-position of laser beam
- K Contains all a given colour location
- FL Flag showing which alien has been hit
- J Control looping

Plane

*High Flying on the
64 with A Cape*

PLANE is written for the Commodore 64 and the object of the game is to shoot the plane as many times as possible before it reaches the ground and then give it over. The program should be saved before you run it.

Program notes

- 1-44 Titles and instructions
- 45-100 Set up variables
- 100-200 Game movement etc
- 200-270 Ending and so on
- 300-640 Firing routine
- 1000-1080 No need to type these lines
- 2000 Graphics set up

```

0 FOR #####
1 REM #
2 REM # COPYRIGHT (C) 1983 A. COPE #
3 REM # #
4 FOR # PLANE IS A GAME FOR C64 #
5 FOR # #
6 FOR #####
7 REM
8 FOR NOT FOR USE WITH SINGH BASIC !
9 REM
10 POKES3250,14 POKES3261,8
20 PRINT"##### AIR- PLANE 64"
21 PRINT"#####
22 PRINT"##### BY A. COPE FOR THE C64 COMPUTER"
23 PRINT"##### INSTRUCTIONS FOR PLAY FOLLOW"
24 PRINT"##### PRESS ANY KEY TO CONTINUE
25 IFPEEK(137)=6400000
30 PRINT"##### INSTRUCTIONS FOR PLAY"
40 PRINT"##### Y = LEFT Z = RIGHT"
41 PRINT"##### SPACE = FIRE" PRINT"
42 PRINT"##### PRESS ANY KEY TO CONTINUE
43 IFPEEK(137)=6400000
44 PRINT"##### POKES3250,10
45 GOTO2000
100 SP=2000
101 SC=50076
102 AC=55297
103 AP=1025
150 POKESP,1 POKESC,0
151 IFPEEK(137)=01THENSP=SP+1 SC=SC+1
152 IFPEEK(137)=20THENSP=SP+1 SC=SC+1
153 IFSP<1904THENSP=1904 SC=50250
154 IFSP>2023THENSP=2023 SC=50295
155 POKESP=1,62 POKESP=1,62
156 IFPEEK(137)=08THENSC=SC+1
200 POKESP,0 POKESC,1
201 POKESP=1,62
301 AP=AP+1 AC=AC+1
400 IFAP<1904THENAC=0
500 GOTO150
600 POKES3272,21
601 PRINT"##### WELL DONE BUT YOU LOST YOUR BASE AFTER !
610 PRINT"##### A HARD BATTLE WITH THE AIR PLANE ....."
620 PRINT"##### YOU SCORED "8" POINTS"
630 FOR#8TO 2500 NEXT RUN
700 POKESP,30 POKESC,7
710 POKESP=40,62 POKESC,7
720 SP=SP+40 SC=SC+40
730 IFPEEK(137)=08THENSP=SP+10 POKES3260,15 POKES3260,10
731 IFSP>1904THENGOTO700
730 POKESP=40,62 POKESP,62 RETURN
740 GOTO700
1000 PRINTPEEK(137)
1001 GOTO1000
2000 POKES2,40 POKESC,40 CLR
2005 POKES3272,(PEEK(13272)+80240)+10
2010 FORI=12288TO12295 READA POKEI,A NEXT
2020 DATA0,130,150,250,170,127,44,0
2030 FORI=12296TO12296+7 READA POKEI,A NEXT
2040 DATA24,24,30,30,165,255,20,66
2045 FORI=12784TO12784+7 READA POKEI,A NEXT
2046 DATA0,0,0,0,0,0,0,0
2047 FORI=12784TO12784+7 READA POKEI,A NEXT
2048 DATA0,0,24,24,24,24,0,24
2050 GOTO100

```

Simple steps to sprite movement

Setting all series and then moving them around

Abstract *Background:* The purpose of this study was to determine the prevalence of self-reported depression and anxiety among a sample of young adults in the United States. *Methods:* Data were obtained from the 2004 National Longitudinal Study of Adolescent Health, a nationally representative sample of adolescents and young adults. *Results:* The prevalence of self-reported depression was 10.3% and the prevalence of self-reported anxiety was 11.2%. *Conclusions:* The prevalence of self-reported depression and anxiety among young adults in the United States is high. *Keywords:* Depression, Anxiety, Prevalence, Young Adults.

THIS ARTICLE is aimed at describing a few of the many ways of defining and handling species from your master programs. Included is a short program that sets up and shows species around the screen.

There are many sources of learning how to use the capabilities of your 64. The most

obvious is to find magazines such as this one, although magazines are of course limited by the amount of space available. If you wish to use slides quickly and easily and have no desire to know much about the way the old handles the information then one of the many slide shows currently available would be a good buy.

For those who do not have money to throw away and wish to understand more about spiders, there are two books currently available which cover spiders adequately. One is *Using the 84* written by Peter Garsden and published by Duckworth (26 88). This is an excellent book and covers all aspects of the 84. The other book is *The Comprehensive Spiderman's Reference Guide* which is available from Comstock. Both of these books are very useful in general and of particular help with spiders. The program included here will only cover some aspects of spiders, but one of the major books mentioned will add the rest of the information.

The program included five wire-line sprayer settings up two channels and moving them around the screen. The sprayers are set up in two different ways as in the

[illegible]

democratic different defining methods.

Now for a brief look at the program. The first line clears the screen and prints a message to black. The variable "W" is set to 9000 as line 20, which is the start of the sprite's end program. All of the work with sprites can be done using 9000 as a base address and adding the appropriate offset. Line 30 sets the header colour and line 40 sets the screen colour. Line 50 prints in blue and line 60 sets the sprite display repeat for all sprites to be displayed. If the address is set to 0 the sprites are turned off.

Line 70 sets the register to select microfont and lines 80 and 90 select the colour for each sprite. Lines 100 to 130 set and select microfont for the sprites. Any sprite data is called by the address in a pointer. The sprite pointers are from location 2000 to 2047 — for example the pointer for location 2040 would tell the 64 where to find the data for sprite 0. The way to calculate the value to be POKE'd into these locations is 64*W.

Location of sprite 0 is so be placed starting at location 012 (the cursor buffer) then (x) would be 12.

Lines 140 and 150 place the data for sprite 0 and sprite 1 at location 000. The loop in lines 160 to 170 reads in the data for sprite 0 and sprite 1 and POKE's it into the cursor buffer. The two branches on lines 180 and 190 set up sprite 2 and 3 then clear the screen. The loop from line 200 to 250 moves sprite 0 and sprite 1 across and clears the screen. Line 260 places both sprite 0 and 1 off the screen.

Simple but effective

The variable "P" is set to 100 in line 260 (100 is the pointer for sprite 1 + 64*P) = 10200 and 100 is the pointer for sprite 0. In the loop from line 280 to 300 for two sprites are moved across the screen, but in each pass through the loop the sprites are swapped. That is a simple but effective way of alternating movement. Lines 310-320 contain a routine to flash or not again.

The data for sprite 0 and 1 is in lines 400 to 400. The data for sprite 2 is in lines 410 to 410. The last two routines read the data for sprite 2 and 3 and convert it into the correct values before POKE'ing them into memory, starting at location 12004 for sprite 2 and location 12152 for sprite 3. This technique is explained and documented in the Commodore reference guide. The advantage of this technique is that the user simply draws the sprite on the screen and the 64 does the rest of the work. The disadvantage is the time the 64 takes to do this — as well as seen by trying the program.

Of the sprite facilities we mentioned here the most important is collision detection and priority. Collision detection is set using location 5120 (for 3 is sprite to sprite and for 1 is sprite to background). Location 5127 sets the sprite to background priority. The other technique that needs some thought concerns the repetition of sprites. The critical expansion is set by location 5121 and the flow control expansion is set by location 5127. ■

```

430 DATA% 11111111111111111111
440 DATA% 111 1 111 11111111
450 DATA% 1111111 11
460 DATA% 111 11111 11
470 DATA% 11111 111 11 11
480 DATA% 11111 111 111
490 DATA% 11 1111111111 11
500 DATA% 111111111111
510 DATA% 11111 111
520 DATA% 11111111
530 DATA% 11111111
540 DATA% 11111111
550 DATA% 11111
560 DATA% 11 11
570 DATA% 11 11
580 DATA% 11 11
590 DATA% 1111 1111
600 DATA% 11111 11111
610 DATA% 11 11
620 DATA% 1111 111 1111 11
630 DATA% 1111 11111 1111 1111
640 DATA% 11111111111111 11111111
650 DATA% 11 111 1 111 11111111
660 DATA% 1111 1111111 11
670 DATA% 1111 11111 11
680 DATA% 111 111 11 11
690 DATA% 11 111 111
700 DATA% 1111111111 11
710 DATA% 111111111111
720 DATA% 11111 111
730 DATA% 11111111
740 DATA% 11111111
750 DATA% 11111111
760 DATA% 111111
770 DATA% 11 11
780 DATA% 11 11
790 DATA% 11 11
800 DATA% 1111 1111
810 DATA% 11111 11111
820 REM SPRITE 2
830 FORI=0TO200
840 READA$
850 FORJ=0TO200:Y=0
860 FORK=0TO7:X=0
870 IF MID$(A$,J+X*8+1,1)="" THEN GOTO 910
880 T=T+2*(7-J)
890 NEXT
900 POKE12000+I*3+K,Y
910 NEXT
920 NEXT
930 RETURN
940 REM SPRITE 3
950 FORI=0TO200
960 READA$
970 FORJ=0TO200:Y=0
980 FORK=0TO7:X=0
990 IF MID$(A$,J+X*8+1,1)="" THEN GOTO 1030
1000 T=T+2*(7-J)
1010 NEXT
1020 POKE12000+I*3+K,Y
1030 NEXT
1040 NEXT
1050 RETURN

```



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The assembler will translate into assembly language the contents of any area of memory whether the 64-K ROM or a user program. Output may be sent either to the screen or a printer.

Figure 1. Relative abundance of *Brachymeria* spp. in the *Agrotis* spp. parasitoid community.

- ENTRY OF NUMERIC VALUES OF ASSEMBLY LANGUAGE INSTRUCTIONS ■ LISTING INDIVIDUALLY OR IN BLOCKS OF PREVIOUSLY ENTERED LINES ■ EDITING INDIVIDUALLY OR CONTINUOUSLY OF EXISTING LINES ■ REINTEGRATION OF EXISTING LINES ■ SAVING OF ASSEMBLY LANGUAGE FILES TO TAPE OR DISC ■ LOADING OF ASSEMBLY LANGUAGE FILES FROM TAPE OR DISC ■ POSITION OF A BLOCK OF MEMORY SPECIFIED BY THE USER TO THE EDITOR ASSEMBLY PROGRAM

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Higgs, p. 13, n. 1. *Continuing the Motherhood Assemblage*
 p. 134 n. 1. *See* <http://www.theresawhite.com/2012/02/01/white>
Continuing the Assemblage, 12–13; <http://www.theresawhite.com/2012/02/01/white>
 or <http://www.theresawhite.com/2012/02/01/white> for more information.

1000-0000-0000-0000

Two's complement: turning positive numbers to negative

Two's complement¹ may sound like a misheard cliché but it is in fact an important mathematical concept used for integers on the Vic as Boris Alton explains

IF THE TIME is now noon, clock, then five hours ago the time was nine o'clock. In ordinary arithmetic $2 - 7 = 9$.

The world, and most of us machines, follow clock arithmetic. To turn through an angle of 400 degrees is to turn to the direction 40 degrees from one's original direction, this day from now is tomorrow is date (but a different year), unless there is a leap year. (We can't make tomorrow one day on leap years) is 1000000 (or 1000000000000) is 75 on the clock.

Only a machine

A computer is only a machine, and a computer can only repeat itself. The basic domain on the Vic 20 (and it can only repeat itself) is a byte. A byte takes values from 0 to 255, and for example $255 + 1 = 0$ and $0 + 1 = 256$. A byte works in clock arithmetic to a base of 256, so there are 256 different numbers from 0 to 255.

On the Vic we can inspect the contents of bytes by the `POKE` command, and if we

```
PRINT POKE(X)
```

where X is the number of a location (in addition to memory), then we print out the value of the number stored in location X . The command to put a value into a location is `POKE`, and

```
POKE X, N
```

will store the value of Numericlizer location X . Being a Vic, values of N must be that it is not possible to `POKE` values of N less than 0 or more than 255 (although this is possible on some other computers). As a byte contains eight bits we can investigate the characteristics of a byte by "manipulating" that is, "copying" the behaviour of an eight bit byte.

Eight bits form a binary number, where the bits are numbered from right to left. The rightmost bit is normally known as bit 0, and the leftmost bit is usually known as bit 7. Each bit has a different weighting to the formation of the value from that binary number.

| Bit | Weight |
|-----|--------|
| 0 | 1 |
| 1 | 2 |

| | |
|---|-----|
| 2 | 4 |
| 3 | 8 |
| 4 | 16 |
| 5 | 32 |
| 6 | 64 |
| 7 | 128 |

For example, 10000110 is a binary number is equivalent to $128 + 64 + 0 + 0 + 0 + 4 + 2 + 0$ is a decimal (or denary) number, or 190. As can easily be found, when all the bits are equal to one the denary value is 255.

Enter the program (published with this article). Run the program, and to the request for the input number enter 190. The program's response is to print the values 190 and 10000110, and — as the binary equivalent of the denary 190 is 10000110 — we obviously have a program to convert denary numbers into binary equivalents.

The operation of the program is fairly simple: the denary number is input and stored in variable V . The number V is then copied into variable N , variable A is set to zero, and variable B is set to one. Variable A is going to contain the representation of the binary number (that is, denary) and variable T will give the position of the digit.

Looping

We go through the loop eight times, and the first task is to find out whether the number is odd, or even. If the number is odd then there is a bit equal to one in the rightmost position, and if the number is even the rightmost bit is zero. Process `POKE(V)` gives the result 1 if the number is odd and the result 0 if the number is even. `POKE(V)`, therefore gives the value of the right most bit.

Suppose we are going through the loop for the first time. The variable B is now equal to the value of the rightmost bit, the variable A has the value zero, and T has the value one. And the comparison to A , by `A = A + B * T`, gives A the value of B .

T is now made 16 times larger, and the value of the variable B is halved by `POKE(V)`, with no remainder (as a result of the `INT` operation in `POKE(V)`). Half of the

binary number 11001 is 1100, and half of 100000 is 10000, so by halving the number (and ignoring the remainder) we have produced a new binary number moved along one position.

At the next iteration of the loop, we find if the new binary number is even or odd (so it the new rightmost bit zero or one?). We find that bit zero in A , by adding `B * T` to A . T is now 10 times greater than before, and the bit value appears at the next digit along in the denary number A .

The binary equivalent value which appears at the end of the program is, in fact, an ordinary denary number which is printed as a binary number. When we have obtained eight bits we end, even though the number may be greater than 255.

Four denary

Here are a succession of values to try

| |
|------|
| 1 |
| 254 |
| 255 |
| 256 |
| 1000 |

in which the results for the first three are not that interesting. The fourth value (so 256) is interesting, as we might be binary number 1 is 10000000 or 0. The number 1000 as an eight bit binary number, is 11000000.

In the second loop arithmetic, at eight bits.

$255 + 1 = 256 = 0$ (as a binary number) and as we all know, in ordinary arithmetic to produce 1000 you have to write

$$1 + 1 = 0$$

Does that mean that 1 is the same as 256, for eight bit binary numbers? Try 1, and you see that it is 11111110, and as you remember 255 is an eight bit binary number is 11111111. Try 2, and the result is 11111100. Amazing!

The leftmost bit, bit -1 and -2 is equal to one, and this is commonly known as the "sign" bit in the special formatted arithmetic. This special form of arithmetic is called "two's complement" arithmetic, and

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```

@ REM PROGRAM 1
10 FNH(Y) = INT(Y/2)
20 FND(Y) = Y - 2*FNH(Y)
100 INPUT V
110 N = V
120 A = 0
130 T = 1
200 FOR I=1 TO B
210 B = FND(N)
220 A = A + B*T
230 T = T*10
240 N = FNH(N)
250 NEXT I
300 PRINT
310 PRINT V, A
320 GOTO 100
READY.

```

Run this program and *is the output for the input number: zero 100*

► To add the integers on the Vic
The reason why two's complement arithmetic is so important becomes clear when you realize that computers can only store positive values. When we perform calculations, we need both positive and negative numbers, and so we have to find some way of storing various positive numbers as if they were really negative numbers.

The 6802 processor, which the Vic uses, has a special "flag" flag which is set by reference to be 1 in the accumulator, and through this all computers use two's complement arithmetic, most do.

Values

First, however, work out what a positive number becomes a negative number: 127 as an eight bit binary number is 01111111 though note that on the Vic the first zero is missing. The binary number 128 is 00000000 and thus has a sign bit set to one: no 128 must not be 128, but the same negative number (just as 255 is 1). If you enter 128 then you find that it is 00000000.

Now integers on the Vic take values between 32768 and 32767. Integers are stored in two bytes and as a result the binary number 32768 is 0000000000000000 and the binary number 32767 is 0111111111111111. Integers on the Vic are stored according to the two complement convention.

Logic

Two's complement also explains about the INT function, enter

```

PRINT INTO 5: INT ( 0.4 )
and the results are 3 and 4. The INT function always rounds down in value and not towards zero. Now try
PRINT INT ( 1/2), INT (1/3)
so which the results are 1 and 0. The explanation of the latter part requires all other INT.

```

As an eight bit binary number the binary number 1 is equal to 00000001 and, to divide by two, we "lose" all the last bit in the rightmost bit. To keep it as an eight bit number we add an one extra into the left: we produce 00000010 (as in the print statements above).

The binary number 1 is (as a two's complement number of eight bits) 01111111. To divide by two we lose the rightmost bit, and the binary is with a seven bit number. To make the number up to eight bits we have to add another bit as the left. As the number is negative we have, to keep the sign bit correct, and so we enter a one at the left. This gives 10111111, which is (as we know) equal to -1.

Now try to

```

PRINT 1+0: 1+0, NOT(0)
and you will find 1+0 and 1. Start with the last first. As a binary number 2 is 00000010 and 1 is 01111111. If the last two binary numbers are compared, it can be seen that they are very similar: where there is a one value 1 on the first there is a one value at the other, and vice versa.

```

Flipping

The NOT function acts at the level of bits and flips each bit from a one and vice versa. Thus in why NOT(12) is 1 and NOT(32768) is 32768.

If something is "not", such as 1=1 then the flip gives not 1. The binary equivalent of 1, number is 01111111 — that is, all bits are "one". When all bits are "flipped", then the number is 00000000, or — in decimal — 0.

There is another way of finding positive and negative numbers known as "one's complement" arithmetic. In this form of arithmetic a negative number is again indicated by its sign bit being one, but the rest of the number differs from the two's complement version.

If the positive version of the number X has the binary value 00011111, then the binary equivalent of X is 01110000. The one's complement form is produced by taking the positive number and flipping the value of every bit. This is exactly the opposite performed when we find NOT(X).

To form a two's complement number we need to multiply places that the two in the number have to be flipped, and one added to the result in other words to form a two's complement number, we first produce a one's complement form and then add one to the two's complement form.

Try this

```

PRINT NOT(1) + 1: 1 + NOT(1)
to check the answer are -1 and 1. The function NOT does not expect the following value to be in parentheses, and it finds the one's complement of 00 = 1 (which is, of course, -1). The second one in the print list is then how to find the two's complement version 1. The value 1 is added to the one's complement form of 1 (which is -1) to produce the two's complement result (ie 0).

```

The Vic many checks on what it is possible to put into with two's complement numbers. To enter

```

%0 = 12700 + 1
is to produce an "ARITHMETIC QUANTITY ERROR" as the eight byte arithmetic 127+0=128 and if we then store these values into two's complement variables 127+0=128. There used to be a whole series of checks on arithmetical values, so that once, such as 32767+1 = 32768 did not occur. ■

```

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```

1429 0000      : SET LESS THAN START OF WORD, NO
1430 0000      : ONLY REQUIRED TO CHECK LO-BYTES
1440 0000      : IF HI-BYTES ARE EQUAL..
1450 0000      :
1460 0000 00FC CHECK      LDA PRDCTP+1
1470 0000 0030      CMP RPTYB+1
1480 0000 0040      BEQ BWARDS
1490 0000      :
1500 0000      : CHECK LO-BYTES
1510 0000      :
1520 0000 0050      LDA PRDCTP
1530 0000 003F      CMP RPTYB+0
1540 0000 0023      BEQ BWARDS
1550 0000      :
1560 0000      : OK, THERE ARE VARIABLES TO TEST.
1570 0000      :
1580 0000 0000 BWARDS     LBY #000
1590 0000 0001      :
1600 0000      : PREPARE TO TEST THIS VARIABLE FOR
1610 0000      : IDENTIFY - IS IT AN INTEGER ?
1620 0000      :
1630 0000 01FF      LDA (PRDCTP),Y
1640 0000 0030      AND $00000000
1650 0000 0000      BEQ NOTINT
1660 0000      :
1670 0000      : IT MUST BE AN INTEGER - SKIP TO
1680 0000      : NEXT VARIABLE BY 7 LOCATIONS.
1690 0000      :
1700 0000 0000      SKIPPIN     CLC
1710 0000 0000 0000      LDA PRDCTP
1720 0000 0000 0007      ADD #007
1730 0000 0001 0000      STA PRDCTP
1740 0000 0000 00FC      LDA PRDCTP+1
1750 0000 0000 0000      ADD #000
1760 0000 0000 0000      STA PRDCTP+1
1770 0000      :
1780 0000      : HAVE STOPPED OVER THIS VARIABLE,
1790 0000      : AND TEST FOR MORE VARIABLES TO
1800 0000      : BE CHECKED.
1810 0000      :
1820 0000 0000 0000      BCC CHECK
1830 0000      :
1840 0000      :
1850 0000      : VARIABLE FOUND WAS NOT AN INTEGER
1860 0000      : SO MAKE IT A BVAL. ?
1870 0000      :
1880 0000 0000 0000      NOTINT     DRY
1890 0000 0000 00FF      LDA (PRDCTP),Y
1900 0000      :
1910 0000      :
1920 0000      : PREPARE IT FOR POSSIBLE LATER CHECK
1930 0000      :
1940 0000 0000 0000      TAX
1950 0000 0000 0000      AND $00000000
1960 0000      :
1970 0000      : IF THE RESULT IS ZERO, THEN A BVAL
1980 0000      : HAS BEEN FOUND, SO SKIP OVER IT.
1990 0000      :
2000 0000 0001 0000      BEQ?      BEQ SKIPPIN
2010 0000      :
2020 0000      :
2030 0000      : A STRING HAS BEEN FOUND, SO TEST
2040 0000      : FOR THE LETTERS 'K' & 'F'.
2050 0000      :
2060 0000      : 'F' IS TESTED FIRST, BECAUSE ALREADY
2070 0000      : AT THE CORRECT POSITION. IN OTHERS,
2080 0000      : BIT 7 OF THE SECOND LETTER IS SET,
2090 0000      : SO A COMPARISON IS MADE WITH THE
2100 0000      : REVERSE 'F' CHARACTER.
2110 0000      :
2120 0000      : BEFORE CHARACTER TO TEST IT
2130 0000      :
2140 0000 0001 0000      BFA      CMP #00C
2150 0000      :
2160 0000      :
2170 0000      : IF NOT KEYS, STOP OVER IT
2180 0000      :
2190 0000 0000 0000      BEQ SKIPPIN
2200 0000      :
2210 0000      :
2220 0000      : SECOND LETTER OF STRING WAS AN 'F',
2230 0000      : WHICH IS A GOOD CHECK, BUT NOT TEST

```

I HAVE BEEN programming more computers for several years now, and during that time have found many annoying flaws in their operation, especially when using Basic. One of the most obvious of these is the inability of Basic to prevent any specification of which keys are valid during input from the keyboard.

In other words, there is no easy way of telling the computer that certain key presses should be ignored. Using Commodore Basic, it is possible to use the GET statement, but this takes a disproportionate amount of time in the number of valid key screens, and further suffers from unreliability in the Stop key. I decided, therefore, to write a simple to operate utility program for the C128 64 in machine code, that could be called from Basic, with ease. In the remainder of this description, the program is referred to by the name Keytest.

Keytest communicates with Basic via three "channels".

- (1) Information is given to the program in a string KEYS (can be abbreviated to KEY).
- (2) The response is returned by the LSK function, with a dummy argument (as a simple default is FEE and PEE).
- (3) The return to Basic is made with an integer value representing the ASCII code of the (valid) key found — with a special value zero.

Simplicity

Keytest is simple to use. First of all, it must be loaded into the computer's memory. This can be achieved using the supplied Basic loader program. Keytest is completely self-contained; consequently although the loader program places Keytest into the unused RAM at \$0000, the user can store Keytest in (for example) the memory buffer by changing the value of variable 5 in line 1000 of the loader (read \$=00). The common sense when using Keytest (if you put it in the cassette buffer, then load a program from tape. Keytest will be overwritten almost certainly causing a crash when next loaded).

Once loaded, the USA screen must be switched to point to Keytest. This is quite simple, and is demonstrated in line 1000 to 1100 of the loader. Thereafter, Keytest can be called using the LSK function.

As listed above, Keytest needs to know which keys to search for. This is done by creating KEYS. But simply KEYS is a string which contains all the valid characters to be searched for. Any keys not in KEYS will be ignored during the scan. The default is to ignore the Stop key (which in fact can be included by using CTRL and C while creating the string, as an alternate feature to changing line 1000).

There is plenty of provision to make Keytest relatively friendly if you happen to define KEYS (Keytest cannot find KEYS, or if KEYS has no characters or a deg KEYS = " ", then Keytest will return to Basic immediately with code 00000000). In the worst possible case, you may forget which keys are legal, but you can break out of Keytest using the Warm Start (RUN/STOP/RESTORE).

Having defined KEYS, the user can tell Keyscan by the IBM Service Any attempt supplied for USS (8) will be ignored by Keyscan. Keyscan will then wait until a valid key is pressed on the keyboard, whereupon it will attempt to find which the ASCII code of that key. This is all demonstrated in the example program, which simply tests for the keys A, B, C, D and X, ignoring all other keys. The example program will finish when X is pressed.

```

10 KEY="ABCDE"
20 L00=000000000000
30 IF END="X" THEN GOTO 70
40 :
50 PRINT
60 PRINT "YOU PRESSED: "L00
70 GOTO 20
80 :
90 PRINT "END"

```

Note: a simple test program

A fully annotated assembly listing is provided, and is summarized here. Lines 1500-1590 define the variables used by Keyscan. Wherever reference is made to binary variables or Kernell constants, the official name (as supplied in the CREF of Programmer's Reference Guide) is used to avoid the clutter.

In lines 1400-1440 Keyscan must search for KEYS. A scan is made through the binary variables, and where a variable is found, it is tested to see if it is KEYS. If no more variables are found, Keyscan returns to loop.

When a variable is found, certain checks are made. The first is "Is it a danger?" (lines 1500-1520). If a "danger" variable is found, it must be stopped over. By lines 1520-1530, lines 1580-1590 test if the variable is real, and if so will stop over it.

In order to be in lines 1530-1570 a string must have been found. Checks are now made to see if it is KEYS. Lines 1630-1650 must be KEYS so a last check is made to make sure that there actually were characters to search for, to prevent the routine from "hanging".

Having found a valid KEYS, certain data must now be obtained: where is the string stored, and how many characters are there to search for (lines 1560-1580). The computer now waits (lines 1630-1650) for the user to type a key. When entered, the key is compared with those in KEYS and a match is found. When the match is found, the ASCII value is calculated (lines 1580-1600). To return a value to Basic, the Integer to Floating Point routine is used.

Happily the above notes need a comparison with the assembly listing should make modifications fairly easy to achieve. As an example, the test may wish to alter the string variable used by Keyscan from KEYS to one of its own choice. This could be arranged quite simply by changing the ASCII codes stored at 14300 and 14305.

Note that because of the way Keyscan is written, and also because of the way Basic recognizes variables, the first letter of a string variable name is stored as an ASCII value (before the data at location 10000) that the second character is stored as the ASCII value with the 7 on. This is why the data for a "required" loop is stored at location 10001. ■

```

1230 C000      FOR THE FIRST LETTER AS A "E"
1240 C000
1250 C000 00      KEY
1260 C000 C000 0170      L00 (PREFETCH)
1270 C000 C000 C700      CWP 0000
1280 C000 C000      END SCAN
:
1290 C000      THE CORRECT STRING HAS BEEN FOUND.
1300 C000      NOW TEST TO SEE IF THERE IS ANYTHING
1310 C000      ON IT TO SCAN FOR.
1320 C000
1330 C000 C000 00      TRY
1340 C000 C000 00      TRY
1350 C000 C000 0170      L00 (PREFETCH)
1360 C000 C000 C700      CWP 0000
1370 C000 C000 C000      END SCAN
:
1380 C000      KEYS DOES NOT HAVE ANY CHARACTERS
1390 C000      OR NO MORE UNUSABLE MORE FOUND.
1400 C000      NO FINISHED DATA FOR EXIT.
1410 C000
1420 C000
1430 C000 C000 0000      REMOVED      L00 0000
1440 C000 C000 00      END
1450 C000 C000 0100      REM EXIT
1460 C000
1470 C000
:
1480 C000      KEYS EXISTS AND DOES CONTAIN SOME
1490 C000      CHARACTERS, SO SET UP SCAN INFORMATION
1500 C000
1510 C000      SETA      SETA PREFETCH=0
1520 C000      CWP      CWP
1530 C000 C000 0170      L00 (PREFETCH)
1540 C000      END
1550 C000      CWP      CWP
1560 C000      L00 (PREFETCH)
1570 C000      SETA PREFETCH+1
1580 C000      PLA
1590 C000      SETA PREFETCH
:
1600 C000      NOW IT IS SIMPLY A CASE OF SCANNING
1610 C000      THE REMOVED TO GET A KEY FOUND
1620 C000      USING THE KERNAL ROUTINE GETIN
1630 C000
1640 C000 C000 0100      GETKEY      GET KEY
1650 C000 C000 0100      REM GETKEY
:
1660 C000      A KEY HAS BEEN PRESSED, SO CHECK FOR
1670 C000      ITS LEGALITY.
1680 C000
1690 C000
1700 C000      L00 PREFETCH+2
:
1710 C000      SCANLOOP      SET
1720 C000      END GETKEY
:
1730 C000      IF THE KEY WAS NOT LEGAL, IT WILL
1740 C000      BE IGNORED.
1750 C000
1760 C000      CHECK IT IN THE STRING.
1770 C000
1780 C000      CWP (PREFETCH)
1790 C000      END SCANLOOP
:
1800 C000      A VALID KEY WAS PRESSED, FOR WHICH
1810 C000      THE ASCII CODE IS NOW IN THE ACCUMULATOR.
1820 C000
1830 C000      NOW HAVE A TINY EXIT.
1840 C000
1850 C000
1860 C000      TRY
1870 C000      L00 0000
:
1880 C000
1890 C000      RETURN VIA THE INTEGER-TO-F.P. ROUTINE
1900 C000      WHICH CAN BE USED TO RETURN VALUES
1910 C000      TO THE 'USER' FUNCTION.
1920 C000
1930 C000 C000 0000      JMP 00000000
1940 C000
1950 C000 C000 0000      C000 0000      C000 0000      C000 0000
1960 C000 C000 0000      C000 0000      C000 0000      C000 0000
1970 C000 C000 0000      C000 0000      C000 0000      C000 0000
1980 C000 C000 0000      C000 0000      C000 0000      C000 0000

```


UFO

Programme not full:
40/1000, 20/1000, 10/1000, 5/1000, 2/1000, 1/1000

5000: Detect bot
5000:5000 Close server
5000:5000 Allow UDP
5000:5000 Information
5000:5000 Information
5000:5000 Close T.S. for connection

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[illegible]

Connect 4

1. **Abstract** 2. **Introduction** 3. **Methods** 4. **Results** 5. **Discussion** 6. **Conclusion** 7. **References**

CONJECT 4 for the Conjectures on similar high-resolution graphs and graphs, in practice an on-screen version of the popular board game of the same name. In order to make use of the full screen each day, it made up of 4x3 characters, and the graphics for the row numbers are represented as by the content of each day.

During play, the selected row for each die is made by pressing keys 1 to 7. Pressing 00 resets a game, whereas F1 loads the strategy from page 24 or 25, the name of each new game.

A sample machine code routine is used during the test page sequence in order to indicate the test values to screen test 130.

1000

| | |
|----|---------------------------------------|
| A | used to read data |
| T | potential purpose |
| N | dir. constant at 0 |
| Y | dir. constant at y |
| C | local constants and dir. |
| BP | used to read C components |
| W | 80/84 and chain on error trap read no |
| W1 | link to dir. chain address |
| W2 | "base + 1" dir. chain |
| W3 | "1" dir. chain |
| W4 | chain of dir. |

77. ~~negative~~
78. ~~negative self image~~

[illegible]

- 14 Clear screen
- 15 screen and border black
- 16 printout A3 (used to simulate PRINT AT)
- 20 receive message during data transfer
- 21 clear screen stage
- 22 receive 32 messages
- 24 setup workspace and note for user 1
- 32 receive message
- 34 turn off keyboard interrupt timer
- 40 switch to channel
- 48 read complete characters set from BDATA as BDATA
- 60 switch to I/O
- 62 re start keyboard interrupt timer
- 64 clear variables
- 66 define disc and graphics
- 68 define Command 4 for only
- 69 set up standard code ranges
- 71 error trap returned as check for correct data
- 74 set character pointer to BDATA
- 80+ read screen into page machine code routine
- 81 86 and for sub page
- 88 define spaces in 1 and p
- 90 10 define shape location and colour of space
- 102 search for space

- 114 check for game restart
- 115 verify $T = 0$
- 116 point keyboard
- 120 check the number of bytes on line
forward
- 122 check for F1 or F7
- 124 skip all too key pressed
- 130 clear screen colour black
- 131 clear keyboard buffer
- 134 define string colour and colour of disc
- 141 set screen variables
- 144 146 print row number at bottom of
screen
- 152 check for key pressed, switch off
color 1
- 154 switch off colour 4
- 156 if F1 clear screen, point only
re start game
- 158 if F7 recall instructions
- 160 if outside range return to 132
- 162 turn on scan 1
- 164 call position of disc, on screen
- 166 if not first space then return to 132
- 171 reset disc, if present
- 174 point to disc
- 176 calculate new pointing
- 178 delay loop
- 180 if disc position same then change
note and return to 171
- 182 184 change colour of disc
- 186 clear keyboard buffer, wait 1
seconds on 132
- 192 210 character on disc for graphics
- 204-209 space disc the disk page
- 206-210 run, home - note disc

```

13 REM **** CLEAR SCREEN / SET INITIAL VARIABLES ****
14 PRINTCHR$(147)
15 Y=53240:POKEY=32:8:POKEY=33:8
16 R#=""
17 PRINTLEFT$(R#,12)&PC$&CHR$(5)*"SETTING UP CHARACTER SET"
22 PORT=87024:POKE54272+T,8:NEXT
24 POKE54256,15
26 POKE54276,32:POKE54277,24:POKE54278,48:POKE54279,8:POKE54272,147
28
29 REM **** PROTECT MEMORY / TRANSFER DATA FROM ROM TO RAM ****
32 POKE532,48:POKE536,48
34 POKE53034,PEEK(53034)&OR254
36 POKE1,PEEK(1)&AND255
38 PORT=87024:POKE14336+T,PEEK(53248+T):NEXT
40 POKE1,PEEK(1)&OR4
42 POKE53034,PEEK(53034)&OR1
44
45 REM **** SET UP CHARACTERS ****
46 T=0:SUM=0
50 READA:IFAC=1THENPOKE15368+T,A:T=T+1:SUM=SUM+A:GOTO55
52
54 REM **** SET UP SPRITES ****
56 T=0
58 READA:IFAC=1THENPOKE12688+T,A:T=T+1:SUM=SUM+A:GOTO58
60
62 REM **** SET UP MACHINE CODE ROUTINE ****
64 T=0
66 READA:IFAC=1THENPOKE24512+T,A:T=T+1:SUM=SUM+A:GOTO66
68
70 REM **** ERROR TRAP ROUTINE ****
72 IFUNCL=5GOTO78PRINTCHR$(147)&CHR$(5)*"ERROR IN DATA STATEMENTS"
74 POKE(Y+24),PEEK(Y+24)&AND240:OR14
76
78 REM **** SET UP TITLE ****
80 PRINTCHR$(147):GOTO40

```

```

82 PRINTLEFT(0A,12)(SPC(4)CHR(31))"BLOS MAY BE CONNECTED TOGETHER"
84 PRINTLEFT(0B,14)(SPC(4)"EITHER HORIZONTALLY, VERTICALLY"
86 PRINTLEFT(0B,16)(SPC(4)"OR DIAGONALLY TO PLACE 4 IN A ROW"
88 PRINTLEFT(0B,18)(SPC(4)"USE KEYS 1-7 TO SELECT YOUR ROW"
90 PRINTLEFT(0B,21)(SPC(4))"LE13.....REVEALS A GAME"
92 PRINTLEFT(0B,23)(SPC(4))"IF73.....RECALLS INSTRUCTIONS"
94 POKE(0+23,255) POKEVC(23,255
96 POKE2040,200 POKEVC(60 POKEVC(1,73) POKEVC(39,1
98 POKE2041,201 POKEVC(2,38) POKEVC(3,73) POKEVC(40,3
100 POKE2042,202 POKEVC(44,120) POKEVC(5,73) POKEVC(41,4
102 POKE2043,203 POKEVC(46,150) POKEVC(7,73) POKEVC(42,5
104 POKE2044,204 POKEVC(48,180) POKEVC(9,73) POKEVC(43,7
106 POKE2045,205 POKEVC(49,210) POKEVC(11,73) POKEVC(44,10
108 POKE2046,206 POKEVC(12,240) POKEVC(13,73) POKEVC(45,13
110 POKE2047,207 POKEVC(14,40) POKEVC(15,73) POKEVC(46,16
112 SUM=0 FORT=0 FORT=SUM+2*7 POKEVC(21,SUM FORT=1701000 NEXTT1,7
114 IFP=1 THENJ24
116 T=0
118 P=PEEK(157)
120 IF(C(10000P=64 THENT=T+1 GOTO118
122 IF(C(200P=4 THENPOKEVC(21,0) FORT=1705000 NEXT GOTO112
124 IFPEEK(157)C=4 THENJ24
126
128 REM ***** GAME START *****
130 PRINTCHR(147) POKEVC(30,0) POKEVC(30,0
132 POKE130,0
134 R=CHR(157)+CHR(157)+(CHR(157)+(CHR(157)+(CHR(157)
136 W=CHR(158)+CHR(158)+CHR(158)+CHR(158)+CHR(158)
138 V=CHR(159)+CHR(159)+CHR(159)+CHR(159)+CHR(159)
140 Z=CHR(160)
142 Y=CHR(161)
144 PRINTLEFT(0A,25)(SPC(1)CHR(19)CHR(15)ILL(SPC(4)CHR(1580)W(SPC(4)CHR(1580)
146 PRINTSPC(4)CHR(1563)SR(SPC(4)CHR(1563)ST(SPC(4)CHR(154)UV(SPC(4)CHR(1580)
148
150 REM ***** KEYBOARD *****
152 GETKEY: IFKEY="" THENPOKE2476,32 GOTO152
154 POKEVC(21,0
156 IFKEY=CHR(133)AND(C(0) THENPRINTCHR(147) R=P GOTO112
158 IFKEY=CHR(136) THENR=0
160 IFKEY="" THENKEY="?" THENJ32
162 POKE2476,32
164 X=(VAL(KEY)-1)*6 C=(100+X
166 IFPEEK(C5)C=32 THENJ32
168
170 REM ***** DROP DISC *****
172 IFY=1 THENPRINTLEFT(0A,7)(SPC(7)Y
174 PRINTLEFT(0B,7)(SPC(7)Z
176 Y=Y+1 C=C+40
178 FORT=17025 NEXT
180 IFPEEK(C5+40) THENPOKE3472,147 Y=Y+6 GOTO172
182 IFZ=CHR(1580) THENZ=CHR(30) GOTO156
184 Z=CHR(158)
186 POKE158,0 Y=1 GOTO152
188
190 REM ***** CHARACTER SET DATA *****
192 DATA0,0,1,3,15,31,63,127
194 DATA1,63,255,255,255,255,255,255
196 DATA2,255,255,255,255,255,255,255
198 DATA3,0,128,192,256,240,252,254
200 DATA4,255,255,255,255,255,255,127
202 DATA5,255,255,255,255,255,255,255
204 DATA6,255,255,255,255,255,255,254
206 DATA7,63,31,15,3,1,0,0
208 DATA8,255,255,255,255,255,255,63
210 DATA9,255,255,255,255,255,252,128
212 DATA10,254,254,254,192,128,0,0
214 DATA11,254,254,254,254,254,248,250
216 DATA12,127,127,127,127,127,127,127
218 DATA13,248,255,255,255,255,252,128
220 DATA14,128,128,128,128,128,128,128
222 DATA15,128,128,128,128,128,128,128
224 DATA16,128,128,128,128,128,128,128
226 DATA17,127,127,127,127,127,127,127
228 DATA18,128,128,128,128,128,128,128
230 DATA19,128,128,128,128,128,128,128
232 DATA20,128,128,128,128,128,128,128
234 DATA21,128,128,128,128,128,128,128
236 DATA22,128,128,128,128,128,128,128
238 DATA23,128,128,128,128,128,128,128
240 DATA24,128,128,128,128,128,128,128
242 DATA25,128,128,128,128,128,128,128
244 DATA26,128,128,128,128,128,128,128
246 DATA27,128,128,128,128,128,128,128
248 DATA28,128,128,128,128,128,128,128
250 DATA29,128,128,128,128,128,128,128
252 DATA30,128,128,128,128,128,128,128
254 DATA31,128,128,128,128,128,128,128
256 DATA32,128,128,128,128,128,128,128
258 DATA33,128,128,128,128,128,128,128
260 DATA34,128,128,128,128,128,128,128
262 DATA35,128,128,128,128,128,128,128
264 DATA36,128,128,128,128,128,128,128
266 DATA37,128,128,128,128,128,128,128
268 DATA38,128,128,128,128,128,128,128
270 DATA39,128,128,128,128,128,128,128
272 DATA40,128,128,128,128,128,128,128
274 DATA41,128,128,128,128,128,128,128
276 DATA42,128,128,128,128,128,128,128
278 DATA43,128,128,128,128,128,128,128
280 DATA44,128,128,128,128,128,128,128
282 DATA45,128,128,128,128,128,128,128
284 DATA46,128,128,128,128,128,128,128
286 DATA47,128,128,128,128,128,128,128
288 DATA48,128,128,128,128,128,128,128
290 DATA49,128,128,128,128,128,128,128
292 DATA50,128,128,128,128,128,128,128
294 DATA51,128,128,128,128,128,128,128
296 DATA52,128,128,128,128,128,128,128
298 DATA53,128,128,128,128,128,128,128
300 DATA54,128,128,128,128,128,128,128
302 DATA55,128,128,128,128,128,128,128
304 DATA56,128,128,128,128,128,128,128
306 DATA57,128,128,128,128,128,128,128
308 DATA58,128,128,128,128,128,128,128
310 DATA59,128,128,128,128,128,128,128
312 DATA60,128,128,128,128,128,128,128
314 DATA61,128,128,128,128,128,128,128
316 DATA62,128,128,128,128,128,128,128
318 DATA63,128,128,128,128,128,128,128
320 DATA64,128,128,128,128,128,128,128
322 DATA65,128,128,128,128,128,128,128
324 DATA66,128,128,128,128,128,128,128
326 DATA67,128,128,128,128,128,128,128
328 DATA68,128,128,128,128,128,128,128
330 DATA69,128,128,128,128,128,128,128
332 DATA70,128,128,128,128,128,128,128
334 DATA71,128,128,128,128,128,128,128
336 DATA72,128,128,128,128,128,128,128
338 DATA73,128,128,128,128,128,128,128
340 DATA74,128,128,128,128,128,128,128
342 DATA75,128,128,128,128,128,128,128
344 DATA76,128,128,128,128,128,128,128
346 DATA77,128,128,128,128,128,128,128
348 DATA78,128,128,128,128,128,128,128
350 DATA79,128,128,128,128,128,128,128
352 DATA80,128,128,128,128,128,128,128
354 DATA81,128,128,128,128,128,128,128
356 DATA82,128,128,128,128,128,128,128
358 DATA83,128,128,128,128,128,128,128
360 DATA84,128,128,128,128,128,128,128
362 DATA85,128,128,128,128,128,128,128
364 DATA86,128,128,128,128,128,128,128
366 DATA87,128,128,128,128,128,128,128
368 DATA88,128,128,128,128,128,128,128
370 DATA89,128,128,128,128,128,128,128
372 DATA90,128,128,128,128,128,128,128
374 DATA91,128,128,128,128,128,128,128
376 DATA92,128,128,128,128,128,128,128
378 DATA93,128,128,128,128,128,128,128
380 DATA94,128,128,128,128,128,128,128
382 DATA95,128,128,128,128,128,128,128
384 DATA96,128,128,128,128,128,128,128
386 DATA97,128,128,128,128,128,128,128
388 DATA98,128,128,128,128,128,128,128
390 DATA99,128,128,128,128,128,128,128
392 DATA100,128,128,128,128,128,128,128
394 DATA101,128,128,128,128,128,128,128
396 DATA102,128,128,128,128,128,128,128
398 DATA103,128,128,128,128,128,128,128
400 DATA104,128,128,128,128,128,128,128
402 DATA105,128,128,128,128,128,128,128
404 DATA106,128,128,128,128,128,128,128
406 DATA107,128,128,128,128,128,128,128
408 DATA108,128,128,128,128,128,128,128
410 DATA109,128,128,128,128,128,128,128
412 DATA110,128,128,128,128,128,128,128
414 DATA111,128,128,128,128,128,128,128
416 DATA112,128,128,128,128,128,128,128
418 DATA113,128,128,128,128,128,128,128
420 DATA114,128,128,128,128,128,128,128
422 DATA115,128,128,128,128,128,128,128
424 DATA116,128,128,128,128,128,128,128
426 DATA117,128,128,128,128,128,128,128
428 DATA118,128,128,128,128,128,128,128
430 DATA119,128,128,128,128,128,128,128
432 DATA120,128,128,128,128,128,128,128
434 DATA121,128,128,128,128,128,128,128
436 DATA122,128,128,128,128,128,128,128
438 DATA123,128,128,128,128,128,128,128
440 DATA124,128,128,128,128,128,128,128
442 DATA125,128,128,128,128,128,128,128
444 DATA126,128,128,128,128,128,128,128
446 DATA127,128,128,128,128,128,128,128
448 DATA128,128,128,128,128,128,128,128
450 DATA129,128,128,128,128,128,128,128
452 DATA130,128,128,128,128,128,128,128
454 DATA131,128,128,128,128,128,128,128
456 DATA132,128,128,128,128,128,128,128
458 DATA133,128,128,128,128,128,128,128
460 DATA134,128,128,128,128,128,128,128
462 DATA135,128,128,128,128,128,128,128
464 DATA136,128,128,128,128,128,128,128
466 DATA137,128,128,128,128,128,128,128
468 DATA138,128,128,128,128,128,128,128
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654 DATA231,128,128,128,128,128,128,128
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804 DATA306,128,128,128,128,128,128,128
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808 DATA308,128,128,128,128,128,128,128
810 DATA309,128,128,128,128,128,128,128
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[illegible]

Abstract: The purpose of this study was to determine the effect of a 12-week training program on the physical fitness and health of sedentary middle-aged men. The subjects were 20 men, aged 40 to 50 years, who were sedentary and had no known cardiovascular disease. They were randomly assigned to either a training group or a control group. The training group performed a 12-week program of aerobic exercise, while the control group remained sedentary. Physical fitness was measured using a variety of tests, including a 1-mile run, a 1.5-mile walk, a 1.5-mile jog, a 1.5-mile swim, and a 1.5-mile bike ride. Health was measured using a variety of tests, including a blood pressure measurement, a heart rate measurement, a cholesterol measurement, and a blood sugar measurement. The results of the study showed that the training group had significantly better physical fitness and health than the control group at the end of the 12-week program. The training group had a significantly lower 1-mile run time, a significantly lower 1.5-mile walk time, a significantly lower 1.5-mile jog time, a significantly lower 1.5-mile swim time, and a significantly lower 1.5-mile bike ride time. The training group also had a significantly lower blood pressure, a significantly lower heart rate, a significantly lower cholesterol level, and a significantly lower blood sugar level. These results suggest that a 12-week training program can improve the physical fitness and health of sedentary middle-aged men.

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1. **Identify the problem.** The first step is to identify the problem. This involves understanding the symptoms and the context in which they are occurring. For example, if a patient is experiencing chest pain, the doctor would need to determine whether it is a heart attack, a panic attack, or something else.

2. **Formulate a hypothesis.** Once the problem is identified, the next step is to formulate a hypothesis. This involves making a educated guess about the cause of the problem. For example, if a patient is experiencing chest pain, the doctor might hypothesize that it is a heart attack.

3. **Test the hypothesis.** The third step is to test the hypothesis. This involves gathering evidence to either support or refute the hypothesis. For example, if a doctor hypothesizes that a patient has a heart attack, they might order a blood test to check for elevated levels of certain enzymes.

4. **Revise the hypothesis.** If the evidence does not support the hypothesis, the doctor will need to revise it. This involves making a new educated guess about the cause of the problem. For example, if a patient's chest pain is not a heart attack, the doctor might hypothesize that it is a panic attack.

5. **Implement the solution.** Once a hypothesis has been confirmed, the next step is to implement the solution. This involves prescribing treatment and monitoring the patient's progress. For example, if a patient has a heart attack, the doctor might prescribe medication and recommend lifestyle changes.

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7 Hardware Changes Making no Sense

Figure 1

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252 DATA3.17.17.17.17.17.17
254 DATA25.0.0.0.255.0.0
256 DATA0.0.0.255.0.0.0.255
258 DATA-1
260
262
262 REM ***** SPRITE DATA *****
264 DATA0.0.0.00.0.0.00.0
266 DATA0.102.0.0.102.0.0.102
268 DATA0.0.96.0.0.96.0.0
270 DATA0.0.0.25.0.0.25.0
272 DATA0.96.0.0.96.0.0.96
274 DATA0.0.96.0.0.102.0.0
276 DATA102.0.0.102.0.0.00.0
278 DATA0.00.0.0.00.0.0.0
280 DATA0.0.0.00.0.0.00.0
282 DATA0.102.0.0.102.0.0.102
284 DATA0.0.102.0.0.102.0.0
286 DATA102.0.0.102.0.0.102.0
288 DATA0.102.0.0.102.0.0.102
290 DATA0.0.102.0.0.102.0.0
292 DATA102.0.0.102.0.0.00.0
294 DATA0.00.0.0.00.0.0.0
296 DATA102.0.0.102.0.0.102.0
298 DATA0.102.0.0.102.0.0.102
300 DATA0.0.110.0.0.110.0.0
302 DATA110.0.0.120.0.0.120.0
304 DATA0.120.0.0.110.0.0.110
306 DATA0.0.110.0.0.102.0.0
308 DATA102.0.0.102.0.0.102.0
310 DATA0.102.0.0.102.0.0.0
312 DATA120.0.0.120.0.0.120.0
314 DATA0.90.0.0.90.0.0.90
316 DATA0.0.90.0.0.90.0.0
318 DATA0.0.0.120.0.0.120.0
320 DATA0.120.0.0.90.0.0.90
322 DATA0.0.90.0.0.90.0.0
324 DATA0.0.0.90.0.0.120.0
326 DATA0.120.0.0.120.0.0.0
328 DATA120.0.0.120.0.0.120.0
330 DATA0.24.0.0.24.0.0.24
332 DATA0.0.24.0.0.24.0.0
334 DATA0.0.0.24.0.0.24.0
336 DATA0.24.0.0.24.0.0.24
338 DATA0.0.24.0.0.24.0.0
340 DATA0.0.0.24.0.0.24.0
342 DATA0.24.0.0.24.0.0.0
344 DATA0.0.0.0.0.0.0.0
346 DATA0.14.0.0.14.0.0.14
348 DATA0.0.20.0.0.20.0.0
350 DATA30.0.0.102.0.0.102.0
352 DATA0.102.0.0.107.0.0.107
354 DATA0.0.107.0.0.0.0.0
356 DATA0.0.0.0.0.0.0.0
358 DATA0.0.0.0.0.0.0.0
360 DATA-1
362
364 REM ***** HALTING CODE DATA *****
366 DATA100.0.100.0.107.0.210.107
368 DATA102.210.100.100.107.0.4.100
370 DATA100.107.100.7.202.240.3.70
372 DATA2.102.102.240.100.0.107.0
374 DATA210.107.240.240.107.224.217
376 DATA107.100.210.107.30.210.107.20
378 DATA217.107.7.210.107.207.210.100
380 DATA107.107.0.4.107.240.4.107
382 DATA224.0.107.100.0.100.107
384 DATA20.4.107.203.0.107.7.0
386 DATA107.207.0.100.40.202.140.102
388 DATA0.100.200.240.174.100.3.240
390 DATA0.70.20.102.100.0.141.0
392 DATA10.141.00.210.140.100.210.141
394 DATA31.210.100.100.141.0.4.100
396 DATA104.141.102.7.100.100.140.00
398 DATA0.100.100.141.031.7.100.00
400 DATA100.100.107.01.4.107.101.4
402 DATA107.101.4.107.201.4.107.201
404 DATA0.107.203.0.107.00.0.100
406 DATA0.107.01.210.107.121.210.107
408 DATA01.210.107.201.210.107.241.210
410 DATA107.20.217.107.00.217.200.240
412 DATA0.70.100.100.100.0.141.00
414 DATA200.141.00.200.00
416 DATA-1
418
420
422 REM *****
424 REM *****
426 REM *****
428 REM ***** CONNECT 4 *****
430 REM *****
432 REM ***** CORRESPOND 04 *****
434 REM *****
436 REM ***** LES HLLAK *****
438 REM *****
440 REM ***** 7TH NOVEMBER *****
442 REM *****
444 REM ***** 1900 *****
446 REM *****
448 REM *****
450 REM *****

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| Address Decimal | Hex | Machine Code | Assembly Code Program |
|--------------------|------|-----------------|--------------------------|
| 49152 | C000 | A2 26 | LDXIM 30 |
| 49154 | C002 | A9 06 | LDARIM 6 |
| 49156 | C004 | 9D 00 DB | STAX 55296 |
| 49158 | C007 | 9D 00 DB | STAX 56256 |
| 49162 | C00A | A9 9F | LDARIM 159 |
| 49164 | C00C | 9D 00 04 | STAX 1024 |
| 49167 | C00F | A9 A0 | LDARIM 160 |
| 49169 | C011 | 9D 00 07 | STAX 1904 |
| 49172 | C014 | CA | DEX |
| 49173 | C015 | F0 03 | BEG 3 |
| 49175 | C017 | 4C 02 C0 | JMP |
| 49178 | C01A | A2 F0 | LDXIM 240 |
| 49180 | C01C | A9 06 | LDARIM 6 |
| 49182 | C01E | 9D 00 DB | STAX 55296 |
| 49185 | C021 | 9D F0 DB | STAX 55596 |

[illegible]

Blockbuster

From Paul Singer at the Center for
 Anti-Corruption Research, Action

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a. *Alternative generation using multi-column models*

Unlike most processors it works on a 2×2 block of characters allowing the building up of whole character images. The characters are built on a large raster image of 160×24 blocks with full mouse control. Keys A, S, M and C enter the alphabets. Space

Malgron and Christner College
Portland, Oregon

Immediately a colour contrast appears on the left side of the display as the side — the player — is once on the field. The character display is displayed on request on a byte by byte and character by character basis, both in digital and in text. It's useful, and fun.

MR CHIP SOFTWARE

VIC 20 GAMES AND UTILITIES

JACKPOT

This is a the classic Fruit Machine for the VIC with single hold and triple 100% machine code. "Overall Jackpot" is a beautifully written, animation giving superb graphics, animation and use of colour. In fact this program makes Commodore's Fruit Machine cartridge look miserably cheap and simple. Home Computing Weekly No. 2018/1/83 £2.50

EWART'S RACE

Amazing fast speed are required for this Shooting Gallery, superb use of colour and graphics in this new and challenging game from the author of *Desktop 100%* machine code, joystick or keyboard control £2.50

PRIMAVERIA

Choose your own game from the following options — difficulty 1-5, speed 1-5, use of basic 1-5, visible or invisible music, infinite moving power pills. Define your own key controls, any combination of that or your type of game, this is the one for you, for the 32 expand VIC only. £2.50

COMMODORE 64 GAMES AND UTILITIES

JACKPOT 64

At last it's here, specially written for the 64 by the author of "JACKPOT" the classic Fruit Machine program for the VIC £2.50

WESTMINSTER

A game for up to four players, who you lead the parts of your choice and win the general election, you now the 64 Commodore's (name) helping votes where you can (just like the real thing) this means for one of the first board type games specifically written for the computer. Why play on your own, share this with your family and friends playing WESTMINSTER. £2.50

RED ALERT

A game for 1-4 players with sound and graphics. Make money in London, London robbery, take from the police, lose some again. Game of whom can be successful, special use for weapons. And watch the secret tactics how to launch the missile and watch the havoc and destruction caused. There is one warning back from RED ALERT £2.50

WHEELER DEALER

A game for two to four players. become a member of the motor trade, you must always pushover, cars and engines in product cars for sale. Burn computers, buy and exchange parts. buy dealerships, but be careful, you may become bankrupt and have to go bankrupt. And what else you can make of, have you got what a talent to become a WHEELER DEALER £2.50

BUSSES (shock only)

This is a shockfield with a difference as you stop on the screen whilst collecting people buses which give you back more and points, they disappear from beneath your feet DO NOT DESPAIR "WILSON" will modestly replace the screen but avoid bumping into bus or its sudden death! An original computer and challenging game £2.50

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SEND OR ENQUIRIES WILL COME


```

1 REM "BLOCKBUSTER". A LITTLE THING FOR
PLAYING WITH MULTI-COLOUR GRAPHICS.
2 REM
3 REM BY MICRO-ANTICS
4 REM
5 REM DON'T TYPE IN REM STATEMENTS
6 REM COL<> IS THE 4 COLOURS. H# IS FOR
HEX VALUES
10 DINCOL<3>:H#="0123456789ABCDEF"
20 INPUT"DOONT OR DATA (C/D)"A#:IFA#="D
"GOTO200
30 PRINT"3" INPUT"SCREEN COL",COL<0>
40 INPUT"CHARAC COL":COL<2> IFCOL<2>>7
THENPRINT"STD COLOUR CODE ONLY" GOTO40
50 INPUT"BORDER COL":COL<1>
60 INPUT"AUXILY COL":COL<3>
61 REM SET SCREEN AND BORDER
70 POKE36879,COL<0>*214+COL<1>+8: POKE
36879,COL<3>*214
71 REM INC NO OF ROWS, DEC COLS, PROTECT
MEM, MOVE CHAR SET, LEN OF KBD BUFF=1.
80 PRINT"3" POKE36867,40 POKE36866,149
POKE36869,255:POKE52,20 POKE56,20 POKE
649,1
81 REM CREATE BLOCK CHAR AND BLANK.
90 FORI=0TO7:POKE7176+I,255 POKE7424+I,0
NEXT
97 REM LOOP TO PUT CHAR DATA ON SCREEN.
98 REM X IS CURSOR LINE, Y IS ROW, T1 IS
CURSOR POS, CHAR1 IS BLOCK.
99 REM SUB3000 CALCULATES CHAR BYTE (T)
AND BIT (T2)
100 X=0:Y=0:FORI=0TO192:T1=7680+X*21+Y:
POKET1,1:POKET1+1,1 GOSUB3000
101 REM CO IS COLOUR TYPE OF BIT PAIR.
110 CO=(PEEK(T)AND3+2*T2)/2+T2:POKET1+30
720,COL(CO):POKET1+30721,COL(CO):GOSUB10
00 NEXTI
111 REM LOOP TO DISPLAY HI RES CHARS.
120 FORY=0TO1:FORX=0TO2:T=7722+10+Y*X*21
:POKET,2+3*Y+X:POKET+30720,COL<2>+0 NEXT
X,Y
121 REM START INPUT.
130 X=0:Y=0
131 REM T=CSR POSN, T2=COL POS OF T, TC=
COL AT CSR.
140 T=7680+X*21+Y:T2=T+30720 TC=PEEK(T2)
141 REM TIME TO CHANGE CSR COLOUR?
150 IFSEC=INT(T1/20)GOTO170
151 REM RESET CSR TIMER & CHANGE CSR COL
160 SEC=INT(T1/20):POKET2,HOTPEEK(T2)AND
7
161 REM D=VAL OF KEY PRESSED + SHIFT KEY
FACTOR. 64 IS NO KEY.
170 D=PEEK(197)+PEEK(653)*168:IFD=64GOTO
150
171 REM KEY PRESSED. RESTORE COL UNDER C
SR.
180 POKET,1:POKET2,TC
181 REM CALC GOTO NUMBER FOR KEY SELECTD
190 CO=-(0*(D=123)+7*(D=23)+6*(D=131)+5*
(D=31)+4*(D=17)+3*(D=34)+2*(D=35)+(D=41)

```

```

>
200 OHC000T0250,250,250,250,240,260,230,
270
210 IFD<>4900T0150
219 REM "E" KEY, HOPHALISE SCRN AND RETH
TO START.
220 POKE36565,240:POKE36566,150:POKE36566
7,40:POKE36579,27:POKE631,0:GOTO20
225 REM CSR RIGHT
230 GOSUB1000:GOTO140
235 REM CSR DOWN
240 X=X+1:X=X*(1+(X>23)):GOTO140
245 REM PUT NEW COL IN AND GOSUB2000 TO
PUT IT IN HI RES CHAR.
250 POKE2,COL(C0-1):POKE2+1,COL(C0-1)
GOSUB2000:GOTO140
255 REM CSR UP
260 X=X-1:X=X-24+(X<0):GOTO140
265 REM CSR LEFT
270 Y=Y-2:Y=Y-16*(Y<0):IFY=14GOTO260
275 REM GO BACK FOR MORE.
280 GOTO140
285 REM ROUTINE TO PRINT OUT DATA
290 PRINT"CHARACTER DATA":D=0
300 PRINT"XXXXXXXXXXXXXXXXXXXXXXXXXXXX"
310 FORC=0T07:T=PEEK(7104+D*0+C0):PRINT
T,"*":MID$(H$,INT(T/16)+1,1);
315 REM LAST HEX CHAR, NB SPACE AFTER T.
320 PRINTMID$(H$,INT(T/16)+1,1):HEXTCO
330 INPUT"NEXT (Y/N)":A$:IFA$="Y"THEND
=(D+1)*-(D<5):GOTO300
340 GOTO20
355 SUB1000 IHCS X AND Y.
1000 Y=Y+2:X=X+(1+(Y<15)):Y=Y*(1+(Y>15)):
X=X*(1+(X>23)):RETURN
2000 GOSUB3000
2010 POKE,(PEEK(T)+AND(255-3*2+T2))+C0-
1)*2+T2:GOSUB1000:RETURN
2999 REM T IS HI RES CHAR BYTE, T2 IS BI
T POSN.
3000 T=7104+24*(1+(Y<0))+X:T2=C-(Y-0*(1+
(Y<5))):RETURN
4000 TO USE
4001 REM SELECT DATA OR CONTINUE
4002 UNDER COHT, ENTER THE FOUR COLOURS
4003 THEN CURRENT CONTENTS OF THE SIX CH
ARACTERS WILL BE DISPLAYED.
4004 THEN USE THE FOLLOWING KEYS TO CREA
TE YOUR CHARACTERS
4005 "E" TO EXIT, "C" FOR CHAR COL, "A"
FOR AUX COL, "B" FOR BORDER COL
4006 "S" FOR SCREEN COL. EACH COL TAKES
TWO FIVE'S IN HOCT, COC HOSE.
4007 MOVE AROUND THE SCREEN USING STANDA
RD CURSOR KEYS.

```

Astro Wars

From David Jones for the unquipped Vic.
 100: PRINT:and input for next 1000

400: but 100 are up the variables. Line 130
 data the screen and turns on the screen.
 Lines 130 to 170 are up the user defined
 graphics. Lines 180 to 200 put you and the
 alien on the screen. Lines 210 to 340 move
 the alien and the screen. 350 to 400 take
 to 400 move you and to move alien. Lines

440-550 are the for routine and check to see
 if you have any stars left.

This program is for the unquipped Vic
 20 and uses a program that can easily be
 changed to the use of any stars (20-400).
 Note the last input line for the unquipped
 several times.

[illegible]

From Richard Horton in *Depression, There*: THIS PROGRAM was written for the unexpanded VHS and though quite brief, it gives an accurate impression of a British Cinema classic.

Singing Roller Canary

```

3  REM KILLER CHIMPY
4  REM B. BARTON, 1983
5  FOR I=0 TO 4
6  C=INT(4095*(RND/255))
7  G=INT(4095*(1+RND/255))
8  SPC=C+H*256+G*256
9  FORM=STOB
10 FOR P=1 TO 70545 STEP 40
11 FORM=FORM+P
12 NEXT P
13 NEXT I
14 NEXT H

```

```

45 MOVX D0
50 MOVX D1
60 MOVX D2 (MOVX D2 = 24000)
70 MOVX D3
80 MOVX D4 (MOVX D4 = 50000)
90 MOVX D5, P
100 MOVX D6
110 MOVX D7
120 MOVX D8

```

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